EMS-SOP #40-1.2-A
EMERGENCY MEDICAL SERVICES
STANDARD OPERATING PROCEDURE &
STANDING ORDERS FOR:

Airway Care, Ventilatory Support & Dyspnea

USAMEDDAC
Fort Leonard Wood, MO
April 2007

UNCLASSIFIED

USAMEDDAC **Emergency Medical Services Plan**
Fort Leonard Wood, MO
April 2007

General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for Airway Care, Ventilatory Support & Dyspnea EMS-SOP #40-1.2-A

Protocol and Standing Orders Reviewed By and Authorized for Use By:

// ORIGINAL SIGNED \\

CARL G. SKINNER, MD
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Primary Point of Contact:

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NREMT-P, CCEMT-P, PNCCT, I/C
Supervisory Paramedic

History. This is a revision publication of the USA MEDDAC Emergency Medical Services, Adult Airway & Ventilatory Support SOP.

Summary. This plan explains the policies, procedures, protocols and standing orders prescribed for all area and levels of EMS personnel for treatment of suspected or confirmed patient chief complaint of Airway Care, Ventilatory Support & Dyspnea of any origin during all out-of-hospital EMS calls, dispatches and inter-facility patient transfers.

This SOP supersedes previously posted FLWEMS Paramedics Adult Protocol for the Management of:

- Airway & Ventilation
- Anaphylaxis
- Congested Heart Failure
- Hyperventilation Syndrome
- Pulmonary Embolism
- Reactive Airway
- Respiratory Distress

Applicability. This patient care protocol (SOP) applies to the Training Support Battalion (TSB) Range Control medics, EMS First Responder personnel of the Fort Leonard Wood Fire & Rescue Department, Emergency Medical Services personnel assigned to the USA MEDDAC Ambulance Section (FLWEMS) and US Army Chemical Defense Training Facility (CDTF) on Fort Leonard Wood and any other out-of-hospital emergency care provider working under or through the Installation Medical Authority (IMA) as delegated to or through the General Leonard Wood Army Community Hospital, Chief of Emergency Medicine or their designee.

Interim Changes. Interim changes to this plan are not official unless they are authenticated by the Chief of Emergency Medicine, USA MEDDAC, Fort Leonard Wood, Missouri. Users will destroy interim changes on their expiration date unless sooner superseded or rescinded.

Distribution. Distribution of this plan is made in accordance with the requirements of the installation.

Mission Statement
To provide prompt, compassionate & exceptional patient care to the service-members, dependants, civilians and visitors of the Fort Leonard Wood installation in a manner that reflects the highest level of competence and professionalism to our community.

To efficiently and responsibly utilize organic assets and resources in a manner that promotes prudent and sound fiscal accountability.

To provide a safe, pleasant and professional work environment for the personnel of the FLWEMS.

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To continuously seek total service improvements through training, education, quality assurance reviews and personal accountability.

To strive not only to be one of the champion EMS organizations in the local region, but also to endeavor to be the exemplary Emergency Medical Service for the entire U.S. Department of Defense.

Scope
Emergency Medical First-Responder personnel not assigned to the General Leonard Wood Army Community Hospital – Ambulance Section and Paramedic personnel assigned to the General Leonard Wood Army Community Hospital – Ambulance Section and Chemical Defense Training Facility or EMS providers attached to any other agency/activity working under the previsions of the General Leonard Wood Army Community Hospital – Department of Emergency Medicine shall not perform skills or practice medicine in a manner that is outside of their "Scope of Practice" as outlined in this SOP or perform expanded scope of practice procedures they have not yet been deemed competent to perform and have appropriate documentation in their individual Competency Assessment Folder (CAF).

Critical Care Emergency Medical Technician – Paramedic (CCEMT-P). Certification as a Critical Care Emergency Medical Technician – Paramedic (CCEMT-P) does not allow for paramedics assigned to the General Leonard Wood Army Community Hospital – Emergency Medical Service (Ambulance Section) to practice with an "Expanded Scope of Practice".

Basic Life Support (BLS) Skills. Unless otherwise ordered by Medical Control all BLS skills listed below shall be performed IAW those references named below:

- BRADY'S Pre-Hospital Emergency Care, 7/e
- BRADY'S © Tactical Emergency Care: Military and Operational Out-of-Hospital Medicine
- BRADY'S © Basic Trauma Life Support, Military Edition
- National Association of Emergency Medical Technicians Pre-Hospital Trauma Life Support (PHTLS) guidelines
- American College of Emergency Physicians (ACEP) Pediatric Basic Trauma Life Support (PBTLS) guidelines
- American College of Emergency Physicians (ACEP) Basic Trauma Life Support (BTLS) guidelines

Advance Life Support (ALS) Skills. Unless otherwise ordered by Medical Control all ALS skills listed below shall be performed IAW those references named below:

- BRADY'S © Paramedic Care: Principles & Practice, Volumes 1 – 5
- BRADY'S © Paramedic Skills Manual, Second Edition
- Mosby's © Nursing Drug Reference, 2005
- Textbook of Military Medicine, Part I – Medical Concepts of the Chemical & Biological Warfare
- USAMRIID, Medical Management of Biological Casualties Handbook, Sixth Edition, April 2005
- USAMRICD, Medical Management of Chemical Casualties Handbook, Third Edition
- American Heart Associations Advanced Cardiac Life Support (ACLS) & Pediatric Advanced Life Support (PALS) guidelines
- National Association of Emergency Medical Technicians Pre-Hospital Trauma Life Support (PHTLS) guidelines
- American College of Emergency Physicians (ACEP) Pediatric Basic Trauma Life Support (PBTLS) guidelines
- American College of Emergency Physicians (ACEP) Basic Trauma Life Support (BTLS) guidelines
- Emergency Nursing Association's Trauma Nurse Core Course (TNCC)
- US Army CDTF SOP Manual
- http://www.nursespdr.com/members/database/
- U.S. National Library of Medicine

Authority
USA MEDDAC, Fort Leonard Wood, MO Command Administration Staff has delegated to the Chief of Emergency Medicine the authority to ensure that the objectives and mission of the Fort Leonard Wood Emergency Medical Services care are achieved. Individual patient care protocols, procedures and standing orders have been reviewed,

approved and authorized for immediate implication by the Chief of Emergency Medicine (EMS Medical Director), USAMEDDAC, Fort Leonard Wood, Missouri.

Medical Over-Site. Individual patient care protocols, procedures and standing orders have been reviewed, approved and authorized for immediate implication by the Chief of Emergency Medicine (EMS Medical Director) or their designee, USAMEDDAC, Fort Leonard Wood, Missouri. These individual protocols, procedures and standing orders shall remain effective (grand-fathered) for use unless appropriately reviewed and changed by the current Chief of Emergency Medicine (EMS Medical Director) or their designee. The General Leonard Wood Army Community Hospital – Emergency Department Medical Control (attending physician on-duty) shall have the authority to modify these policies, procedures and standing orders as needed to optimize out-of-hospital patient care. These modifications shall only be made on a case-by-case basis and may be subject to Quality Assurance reviews. All deviations/augmentations of these policies, procedures and standing orders shall be documented.

Medical Director. Board certified emergency medical physician assigned to the General Leonard Wood Army Community Hospital Emergency Department as Chief of Emergency Medicine. Individual patient care protocols, procedures and standing orders must be reviewed and approved by the Medical Director or their designee prior to implementation.

Medical Control. Pre-Hospital Emergencies. Primary physician "on-duty" in the General Leonard Wood Army Community Hospital Emergency Department with privileges to provide emergency medical care IAW Department of Army and USAMEDDAC guidelines.

Intra-Facility Transports. Referring and/or receiving physician(s) or physician's assistant directly involved with a specific patient's case.

EMS Provider. Emergency medical care personnel assigned to an ambulance team or rescue squad charged with providing the routine, urgent and emergent patient care in an out-of-hospital situation. During all out-of-hospital patient care contacts/transports, regardless of acuity, a paramedic assigned to the FLWEMS shall "attend" on all patient care cases addressed by the FLWEMS. In specific case where situations warrant additions medical specialties, i.e. physician, nurse or technician, a paramedic assigned to the FLWEMS shall "co-attend" during all patient transports.

Objectives
Provide exceptional out-of-hospital emergency patient care.

Chemical Defense Training Facility Considerations. These protocols, procedures and standing orders are to be used in conjunction with the US Army Chemical Defense Training Facility Standard Operating Procedures. At all times, consult with GLWACH Medical Control for treatment clarification as needed.

Patient Advocacy. Patient care and safety shall be the primary focus of the Fort Leonard Wood Emergency Medical Services (FLWEMS). A request for urgent/emergent medical/trauma/psychiatric care must be honored as long as the request is legal & ethical. Patients deserve to be informed, when possible, of all decisions affecting their care and transport. Competent adults have the legal to accept or refuse treatment and/or transport recommendations. Immediate family members should be considered an extension of the patient in notification and scene management. Family members should be treated with dignity, respect and supported in their role as the patient's advocate.

Nondiscrimination Statement. The Fort Leonard Wood Emergency Medical Services teams operating IAW this SOP shall serve as the patient's advocate and will provide prompt routine/urgent/emergent response, treatment and transport upon request regardless of ability to reimburse, and shall have no regard to race, color, religion, gender, national origin, age, disability, disease, marital status, sexual orientation or any other factor.

Do Not Resuscitate (DNR) Orders & Living Wills. EMS personnel shall not follow DNR orders unless they have first contacted Medical Control. FLWEMS personnel should never make DNR decisions on their own. A physician MUST make that decision. A living will MUST be signed by the patient. A family member cannot decide DNR. If there is a question or disagreement among family members, resuscitation efforts should be implemented. Doing more than necessary is legally safe vs. the potential unsafe legal consequences of doing nothing. Immediately contact Supervisory Paramedic for problems or issues involving a specific case. If indicated, provide appropriate ALS care if there is no documented (written) orders/will.

Communications. FLWEMS personnel shall use the Missouri State-Wide HEAR radio system (VHF Frequency: 155.340) as the primary means of providing patient information communication via radio. In the event that this radio system fails, FLWEMS personnel should contact Medical Control via cellular phones mounted in each FLWEMS ambulance. When conditions warrant, FLWEMS should provide sensitive patient report information to Medical Control via cellular phone to provide an elevated level of patient privacy and safety, i.e. senior level diplomats and government officials, situations that might incite public fear/concern, or confirmed Chemical Accident/Incident Response Assistance (CAIRA) related victims. At no time should patient(s) name(s) or full demographic information be given via radio or cellular phone systems.

Documentation. All EMS patient contacts shall be appropriately documented using authorized FLWEMS Patient Report Forms. All patient care documentation shall be done using the S.O.A.P.E. format. Each patient contact shall also be given an individual "Incident Number" that shall be documented on all EMS patient care report forms and tracked by using the current EMS Patient Care Log system/data base. In any case, involve Medical Control at the earliest opportunity for guidance.

Intent
It is the "intent" of this SOP to give all Fort Leonard Wood Emergency Medical Services (FLWEMS) paramedic personnel assigned to the GLWACH Ambulance Section and Chemical Defense Training Facility, Training Support Battalion Medical Personnel, Fort Leonard Wood Fire & Rescue EMS First-Responders and any other activity operating IAW this SOP written guidelines to manage a wide variety of common airway and respiratory emergencies. EMT's and Paramedics must always make thorough situational and patient assessments and base specific treatment plans based on those case-by-case findings. The General Leonard Wood Army Community Hospital – Emergency Department Medical Control (attending physician on-duty) shall be contacted prior to any modifications to these protocols, procedures and standing orders as needed to optimize out-of-hospital patient care.

Orientation & Education
Competency Assessment. This individual protocol, procedure and/or standing order may have its own Competency Verification method. In all cases, competency assessment will be conducted IAW USAMEDDAC Pam 40-49. All paramedics providing ALS care IAW this SOP shall verify competency and proficiency with skill within the SOP at least every two years.

Quality Assurance. These protocols, procedures and/or standings may be reviewed periodically to assure that stand-of-care is being maintained.

Performances
Performance validation for skills within this SOP may be done by direct observation by supervisor, peer chart review, continuing education and/or skills testing.

Annual Evaluation
The protocols, procedures and/or standings contained within this SOP may be reviewed periodically to assure that stand-of-care is being maintained.

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Summary of Changes

- SOP Format.
- Adding of Summary, History, Applicability, Interim Changes, Distribution and Content Index statements.
- Adding of Mission Statement, Scope, Authority, Objectives, Intent, Orientation & Education, Performances and Annual Evaluation statements.
- Assigning of EMS-SOP number.
- Purpose statement. Includes BLS care considerations.
- Scope of Practice guidelines incorporated for the Fort Leonard Wood Training Support Battalion, SAPPER & GLWACH Military Medics (68W), General Leonard Wood Army Community Hospital Civilian EMT-Basics, Intermediates & Paramedics and Fort Leonard Wood Fire & Rescue Department (EMT-Basics, Intermediates & Paramedics).
- This SOP supersedes and call for the rescinding of all previous adult airway, ventilatory support and dyspnea related SOP's to include:
  - Ventilatory and Airway Support.
  - Anaphylactic Reactions.
  - Pulmonary Edema/Congestive Heart Failure (CHF).
  - Hyperventilation Syndrome.
  - Reactive Airway Disease.
  - Respiratory Distress (Dyspnea).
- Storage and use of **LORAZEPAM** (Ativan) as an alternative sedative to help facilitate intubation.
- Use of **RACEMIC EPINEPHRINE**, **SOLU-MEDROL**, and **ROMAZICON**.
- Specific illness appendixes added.
- Specific skill annexes added.
- Capnograph (EtC02) monitoring.
- Procedures and medication administrations being based on standing orders rather than creating a critical delay in patient care by utilizing Medical Control in the severally ill patient.
- Utilization of non-surgical cricothyrotomy airway devices.
- Utilization of CBRN Bag-Valve-Mask respirator.
- Use of adult autoventilatory system.
- Use of Continuous Positive Air Pressure (CPAP) system.

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Scope of Practice

Scope of Practice guidelines for assessment tools, airway adjunct(s)/procedures intervention skills and pharmaceutical administrations for all activities, units, organizations and personnel operating under the "General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for Airway Care, Respiratory Distress Problems and Dyspnea."

(MC): Denote interventions that require direct authorization from on-line physician "Medical Control" of the General Leonard Wood Army Community Hospital – Emergency Department and/or the Chemical Accident or Incident Response & Assistance (CAIRA) Medical Response Team Leader (MRTL), CAIRA Medical Augmentation Team Leader (MATL) and/or transferring provider or receiving facility "Medical Control" physician for inter-facility patient transports.

X: Denotes Authorized Skill Set	O: Denotes A NON-Authorized Skill Set

	General Leonard Wood Army Community Hospital & Chemical Surety EMT-Paramedics	Fort Leonard Wood Training Support Battalion, Military Police, SAPPER & GLWACH Military Medics (68W)	General Leonard Wood Army Community Hospital Civilian EMT-Basics & Intermediates	Fort Leonard Wood Fire & Rescue Department (EMT-Basics, Intermediates & Paramedics)
Administration of **OXYGEN** (Humidified or Non-Humidified) 2-15Lpm by appropriate delivery device	X	X	X	X
Placement of Oropharyngeal Airway Adjunct	X	X	X	X
Placement of Nasopharyngeal Airway Adjunct	X	X	X	X
Oropharyngeal Suctioning	X	X	X	X
Nasopharyngeal Suctioning	X	X	X	X
Use of Mouth to Mask Ventilatory System	X	X	X	X
Use of Bag-Valve-Mask System	X	X	X	X

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Use of Bag-Valve-Mask-to-Tracheotomy-Tube Ventilation	X	X	X	X
Use of Bag-Valve-Mask-to-Stoma Ventilation	X	X	X	X
Use of Rigid Tip Suction Catheter Devise	X	X	X	X
Use of Soft Tip Suction Catheter Devise	X	X	X	X
Head-Tilt / Chin Lift Manual Airway Positioning	X	X	X	X
Modified Jaw-Thrust Manual Airway Positioning	X	X	X	X
"Finger-Sweep" to Remove Foreign Body Object	X	X	X	X
Abdominal Trust to Remove FBO in Airway	X	X	X	X
Placement of Comi-Tube®	X	(MC) X	(MC) X	(MC) X
Use of Anesthesia Bag with Monometer	X	O	O	O
Application of Cricoid pressure (Sellick Maneuver)	X	X	X	X
Use of Sp02 Monitoring Machine	X	X	X	X
Establishing IV Access Using **0.9% NORMAL SALINE** (0.9% NaCL.) or **LACTATED RINGERS** (LR)	X	(MC) X	O	O
Acquiring 3 Lead Electrocardiography	X	O	O	O

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Use of Air Flow, OXYGEN Powered Demand Ventilation Device (Positive Air Ventilator)	X	(MC) X	(MC) X	(MC) X
Use of Nasal Cannula, Simple Face Mask, Non Re-Breather, Partial Non Re-Breather and Venturi Mask	X	X	X	X
Acquiring 12 Lead Electrocardiography	X	O	O	O
Acquire EtC02 Value(s) and Capnograph Tracing	X	O	O	O
Administration of **ALBUTEROL** (Proventil) 2.5mg in 3mL **SALINE** Nebulizer	X	(MC) X	O	O
Administration of **ATROVENT** (Ipratropium) 0.5mg with **ALBUTEROL** (Proventil) 2.5mg Nebulizer with no **SALINE** bullet PRN	X	O	O	O
Administration of **FURSOSIMIDE** (Lasix) 20-120mg IVP PRN	X	O	O	O
Administration of **TERBUTALINE SULFATE** (Brethine) 0.25mg SQ	X	O	O	O
Administration of **DIAZEPAM** (Valium) 2-10mg IVP	X	O	O	O
Administration of **SUCCINYLCHOLINE CHLORIDE** (Anectine) 1 – 1.5mg/kg IVP over 30 – 60 seconds, in conjunction with sedative	X	O	O	O
Administration of **RACEMIC EPINEPHRINE 2.25%** (AsthmaNefrin) 0.05mL/kg in 3mL of **SALINE**, max dose of 0.5mL	X	O	O	O
Administration of **DIPHENHYDRAMINE HCI** (Benadryl) 25-50mg IVP or IM	X	O	O	O
Administration of **NALOXONE HCI** (Narcan) 1-2mg IVP, IM, SQ, or ETT	X	O	O	O
Administration of **ETOMIDATE** (Amidate) 0.35mg/kg IVP	X	O	O	O
Administration of **LORAZEPAM** (Ativan) 2-5mg IVP	X	O	O	O

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NORCURON (Vecuronium) 0.08-0.1mg/kg IVP, (then 0.01-0.015mg/kg for prolonged procedures) in conjunction with sedative	X	O	O	O
Administration of **EPINEPHRINE 1:1000** SQ 0.3-0.5mg or **EPINEPHRINE 1:10,000** 1mg IVP	X	O	O	O
Administration of **NITROGLYCERIN SPRAY** 0.04mg SL PRN	X	O	O	O
Administration of **ATROPINE SULFATE** 0.5mg-3mg IVP, ETT or IM	X	O	O	O
Administration of **NITROGLYCERIN IV INFUSION** (Tridil) IVPB 10 – 20mcg/minute	(MC) X	O	O	O
Administration of **THEOPHYLLINE** (Aminophylline) Infusion 250mg/100cc over 20-30 minutes.	X	O	O	O
Administration of **HEPARIN** (Calcilean) 5000U – 7500U IVP, then IV infusion at 1000U/hour.	(MC) X	O	O	O
Administration of **MORPHINE SULFATE** 2-20mg IVP or IM	X	O	O	O
Administration of **LIDOCAINE HCl** 1mg/kg IVP or ETT	X	O	O	O
Administration of **MIDAZOLAM HCl** (Versed) 2-10mg IVP	X	O	O	O
Administration of **ZEMURON** (Rocuronium Bromide) 1mg/kg IVP, in conjunction with sedative	X	O	O	O
Administration of **METHYLPREDNISOLONE** (Solu-Medrol) 125mg in 50cc or 100cc **0.9% NORMAL SALINE** IVPB over 10 minutes.	X	O	O	O
Administration of **FLUMAZENIL** (Romazicon) 0.2-0.5mg IVP	(MC) X	O	O	O
Direct tracheal suctioning	X	O	O	O

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Use of "PERTRACH" non-surgical airway device	X	O	O	O
Surgical cricothyrotomy airway	X	O	O	O
Direct Laryngoscope with use of McGill Forceps for removal of foreign body airway obstruction	X	O	O	O
Use of hand-held "pump" suction devise	X	X	X	X
Thoracentesis (Needle Chest Decompression)	X	O	O	O
Administration of **AFRIN SPRAY** PRN	X	O	O	O

WARNING

Administration of **FLUMAZENIL** (Romazicon) by EMS personnel shall be for EMS induced benzodiazepine overdoses only. **FLUMAZENIL** (Romazicon) shall not be administered by EMS personnel as a prophylactic treatment of suspected or confirmed benzodiazepine overdose not caused by EMS personnel.

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AIRWAY ASSESSMENT

Assessment & Treatment Procedures
Determine Level of Consciousness.

Does patient self-support and/or maintain their own airway adequately?

Conscious

Unconscious

1. Assess airway patentcy.

2. Clear airway as needed. If airway is unable to be cleared with abdominal trust, finger sweeps or direct laryngoscope with McGill forceps, consider cricothyrotomy.

3. Secure airway with appropriate adjunct device. If patient is unconscious with no gag reflex, RSI procedures should not be utilized.

4. Maintain airway adequacy, provide high considerate amounts of **OXYGEN** via appropriate mechanical ventilatory systems.

5. Apply and acquire the following diagnostic tracings:

- ► Electrocardiograph (3 & 12 Lead)
- ► Capnograph/EtC02
- ► Sp02
- ► Temperature

6. Suction airway as needed.

7. Continue patient assessments. Determine probable cause of airway failure and/or dyspnea and treat as appropriate IAW Appendixes A through R of this SOP.

Yes

1. Administer supplemental **OXYGEN** 2-15Lpm as needed.

2. Continue patient assessments and treat appropriately.

No

1. Consider the placement of a basic airway devise that will not normally cause a gag reflex, i.e. NPA.

2. Administer supplemental **OXYGEN** 2-15Lpm as needed.

3. Assist ventilation efforts as needed.

4. Apply and acquire the following diagnostic tracings:

- ► Electrocardiograph (3 & 12 Lead)
- ► Capnograph/EtC02
- ► Sp02
- ► Temperature

5. Secure airway with appropriate adjunct.

6. Maintain airway adequacy, provide high considerate amounts of **OXYGEN**.

7. Suction airway as needed.

8. Continue patient assessments. Determine probable cause of airway failure and/or dyspnea and treat as appropriate IAW Appendixes A through R of this SOP.

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RESPIRATORY DISTRESS (Dyspnea)

Assessment & Treatment Procedure

1. Take universal precautions and apply PPE.
2. Airway secured as per previous algorithm.
3. Provided supplemental **OXYGEN** as needed.
4. Acquire and assess:
   a. Accurate Patient Past Medical History to Include Recent Hospitalizations.
   b. Current Rx, OTC and Herbal Medications.
   c. Electrocardiograph.
   d. Capnograph/EtC02.
   e. Respiratory Rate, Depth and Adequacy.
   f. Sp02.
   g. Lung Sounds.
   h. Blood Pressure and Pulse Rate.
   i. Body Temperature.
   j. Blood Glucose Levels.
5. EMT's do not diagnose patients. However, EMT's do assess and determine probable cause of illnesses. Determine primary cause of respiratory distress and direct treatment IAW the following guidance.

Primary Suspected Cause of Respiratory Distress	Refer to Appendix
► Adult Respiratory Distress Syndrome (ARDS, Acute Lung Injury)	A
► Anaphylaxis	B
► Carbon Monoxide Inhalation	C
► Cardiac Related Problems	D
► Chronic Bronchitis, Acute Exacerbation of	E
► Croup (Epiglottitis, Laryngotrachobronchitis)	F
► Dyspnea of Unknown Origin	G
► Failed Airway	H
► Foreign Body Obstruction	I
► Hyperventilation Syndrome	J
► Lung Cancer	K
► Pneumonia	L
► Pulmonary Edema	M
► Pulmonary Embolism	N
► Reactive Airway Disease (Includes Asthma, COPD & Emphazemia)	O
► Respiratory Arrest	P
► Spontaneous Pneumothorax	Q
► Toxic Inhalation	R
► Upper Respiratory Infection	S

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INFECTIOUS RESPIRATORY DISEASE CONSIDERATIONS

Indication
To outline EMS First-Responder's care and management of the patient with known or suspected infectious respiratory disease. Infectious respiratory diseases include but are not limited to:

- Influenza of any Type
- The Common Cold
- Strep Throat
- Respiratory Infections of Unknown Origin
- Tuberculosis (TB)
- Staphylococcus
- Bacterial Meningitis
- Viral Meningitis
- Respiratory Syncytial Virus
- Severe Acute Respiratory Syndrome (SARS)
- Methicillin-Resistant Staphylococcus Aureus (MRSA)

Signs & Symptoms
Non-specific signs and symptoms of these infections may include but are not limited to:

- Headache
- Runny Nose
- Tearing Eyes
- Sore Throat
- Chills
- Pyrexia
- Dyspnea
- Tachycardia
- Loss of Appetite
- Tachypnea
- Congestion
- Nausea & Vomiting
- Diarrhea
- Fatigue
- Weakness
- Muscle Weakness
- Generalized Body Aches

Procedure

1. Donn appropriate Personal Protective Equipment (PPE) to include respiratory protection as needed.

2. EMS personnel should practice exceptional hand washing/sanitizing techniques.

3. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

4. Provide only those invasive procedures that are absolutely necessary for the acute care of the ill. EMS personnel should not perform invasive procedures that may increase the risk of cross contamination unless critical to the patient's specific care needs.

5. When possible, utilize air purification, circulation and/or vacuum systems (HIPPA-Air Purifier). This system is only available to FLWEMS Medic 4. When this unit is available, this system should be used for all inter-facility patient transports for patients with active infectious respiratory disease disorders, i.e. Influenza of any Type, Tuberculosis (TB), Methicillin-Resistant Staphylococcus Aureus (MRSA), etc.

6. If time and patient condition warrants, make pre-transport vehicle protection precautions as needed, i.e. plastic drops, seal cabinets and compartments, etc.

7. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

8. Assure that receiving facility has taken the proper precautions prior to bringing the patient in to the medical

Appendix A
Adult Respiratory Distress Syndrome
(ARDS, Acute Lung Injury)

General
Acute respiratory distress syndrome (ARDS) is a type of severe, acute lung dysfunction affecting all or most of both lungs that occurs as a result of illness or injury. Although it is sometimes called adult respiratory distress syndrome, it may also affect children. Major symptoms may include breathing difficulties (dyspnea), rapid breathing (tachypnea), excessively deep and rapid breathing (hyperventilation) and insufficient levels of OXYGEN in the circulating blood (hypoxemia). ARDS may develop in conjunction with widespread infection in the body (sepsis) or as a result of pneumonia, trauma, shock, severe burns, aspiration of food into the lung, multiple blood transfusions, and inhalation of toxic fumes, among other things. It usually develops within 24 to 48 hours after the original illness or injury and is considered a medical emergency. It may progress to involvement of other organs.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Special attention should be focused on respiratory assessment and airway management. If not intubated, monitor closely for vomiting.

3. Treat all underlying respiratory illnesses as appropriate IAW this SOP.

4. Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL.).

5. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix B
Anaphylaxis

Indications
To outline the EMS care for patients experiencing anaphylactic reactions. Symptoms may include dyspnea, urticaria, hypotension and angioedema.

Goal
To optimize Oxygenation, tissue perfusion and prevent cardiovascular collapse.

Procedures

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Administer **ALBUTEROL** (Proventil) 2.5mg in 3mL **SALINE** for bronchospasm and wheezing. Repeat continually as needed.

3. Consider **ATROVENT** (Ipratropium) 0.5mg with **ALBUTERO** 2.5mg with no **SALINE** bullet.

4. Establish IV access and infuse **LACTATED RINGERS** or **0.9% NORMAL SALINE** at a rate of 20-30cc/hr.

5. Consider **DIPHENHYDRAMINE HCl** (Benadryl) 25-50mg deep IM or IVP.

6. Monitor perfusion, Sp02, EtC02 and ECG.

7. Administer medications as follows as needed:

   a. **Mild to Moderate Distress:**
   (Urticaria and wheezing)

      (1) Consider **EPINEPHRINE 1:1000** SQ 0.3-0.5mg 1:1000 solution may be repeated every 15-30 minutes as needed (omit if reaction is mild, patient is stable or age is > 40 y/o).

   b. **Severe Distress**
   (Dyspnea, urticaria and hypotension)

      (2) Consider **EPINEPHRINE** (routes are optional) choose only one:

      SQ: 0.3-0.5mL of 1:1000 solution every 15 minutes.

      SIVP: 0.1mg (0.1cc) of 1:1000 solution in 10cc of **NORMAL SALINE** or 0.1mg (1cc) of 1:10,000 solution repeated as needed.

      SL: 0.3-0.5cc of 1:1000 solution every 15 minutes.

      ETT: 1.0cc of 1:1000 solution in 10cc of **NORMAL SALINE** or 10mL of 1:10,000.

      IVPB: 1-6 mcg/minute titrate by 1mcg increments.
      (Mix 1cc of 1:1000 solution in 250cc of **NORMAL SALINE** or **D5W** = 4mcg/cc)

8. Administer **LACTATED RINGERS** or **0.9% NORMAL SALINE** IVPB infusion 20mL/kg up to 2 liters to maintain SBP of >90mm/Hg.

9. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix C
Carbon Monoxide/Smoke Inhalation

Characterization

1. Carbon monoxide is a tasteless, odorless, invisible gas that can build up in enclosed areas where fuels such as natural gas, gasoline, fuel oil, or wood are burned. When a person inhales carbon monoxide, it begins to replace the OXYGEN that is normally carried in the blood, which leads to carbon monoxide poisoning.

2. Fuels that produce carbon monoxide are burned in indoor heating systems, car engines, boat motors, cooking appliances, wood fires, and other places. Dangerous levels of carbon monoxide can build up in semi-enclosed or even open areas, including swim areas behind boats.

3. Carbon monoxide poisoning can cause headaches, dizziness, or nausea. If the exposure to carbon monoxide continues, a person may lose consciousness and even die. Carbon monoxide poisoning can be hard to identify. The symptoms can also be caused by several other illnesses.

4. Treatment for carbon monoxide poisoning involves bringing blood OXYGEN levels back to normal. It is important that an affected person be removed from the area where carbon monoxide may be present and begin OXYGEN therapy if needed.

Symptoms of Carbon Monoxide Inhalation May Include

1. Symptoms of carbon monoxide poisoning range from mild flu-like symptoms (such as headache or stomachache without fever) to severe signs of heart and brain damage. Prolonged exposure to low levels of carbon monoxide occurring over many days may result in death.

2. People respond differently to the same level of carbon monoxide. Because of this, carbon monoxide poisoning can range from mild to severe in different people with the same level of exposure.

3. Symptoms of carbon monoxide poisoning are nonspecific and can be similar to symptoms of other illnesses. These symptoms include:

   a. Headache.

   b. Nausea, vomiting (often seen in children).

   c. Dizziness.

   d. Fatigue.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Special attention should be focused on respiratory assessment and airway management. If not intubated, monitor closely for vomiting, which is common in Carbon Monoxide poisoning, and have suctioning available. In all cases where both conditions of carbon monoxide toxicity and severe burns exist concomitantly, the Burns Trauma Protocol should be followed.

3. If Carbon Monoxide/Smoke Inhalation is not obvious, consider other causes for decreased level of consciousness such as drug overdose, hypoglycemia and hypotension, and proceed to the Altered Mental Status Protocol if indicated.

4. Hyperbaric Chambers are available at regional Level I Trauma Centers upon contact with Medical Control physician.

Appendix D
Cardiac Related Problems

Characterization
Dyspnea as a secondary problem to a cardiac illness.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Refer to General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for Cardiac Care and treat per appropriate algorithm.

3. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix E
Chronic Bronchitis, Acute Exacerbation of

Characterization

1. Bronchitis is a respiratory disease in which the mucous membrane in the lungs' bronchial passages becomes inflamed. As the irritated membrane swells and grows thicker, it narrows or shuts off the tiny airways in the lungs, resulting in coughing spells accompanied by thick phlegm and breathlessness. The disease comes in two forms: acute (lasting less than 6 weeks) and chronic (reoccurring frequently for more than two years). In addition, people with asthma also experience an inflammation of the lining of the bronchial tubes called asthmatic bronchitis.

2. Acute bronchitis is responsible for the hacking cough and phlegm production that sometimes accompany an upper respiratory infection. In most cases the infection is viral in origin, but sometimes it's caused by bacteria. If patient is otherwise in good health, the mucous membrane will return to normal after recovering from the initial lung infection, which usually lasts for several days.

3. Acute bronchitis is generally caused by lung infections; approximately 90% of these infections are viral in origin, 10% bacterial. Chronic bronchitis may be caused by one or several factors. Repeated attacks of acute bronchitis, which weaken and irritate bronchial airways over time, can result in chronic bronchitis.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Consider the administration of:

   a. **IPRATROPIUM BROMIDE** (Atrovent) 0.5mg with **ALBUTEROL** (Proventil) 2.5mg with no saline. May repeat this dose every five to ten minutes as needed.

3. Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL.).

4. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix F
Croup
(Epiglottitis, Laryngotrachobronchitis)

Characterization

1. Croup is a common respiratory problem characterized by a harsh, barking cough. Croup most often affects young children. It causes inflammation, swelling, and narrowing in the voice box (larynx), windpipe (trachea), and breathing (bronchial) tubes leading to the lungs.

2. Croup symptoms often develop a few days after the start of what appears to be an upper respiratory infection (URI), such as a cold. Most cases are caused by human parainfluenza viruses types I and II. However, other viruses, such as influenza viruses types A and B, respiratory syncytial virus (RSV), and measles, can also cause croup. As children grow older and structures in the throat and breathing tubes mature, they are less susceptible to croup.

Treatment Procedures

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **HUMIDIFIED OXYGEN** as needed.

2. Have equipment ready for endotracheal intubation.

3. Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL.).

4. Consider **ALBUTEROL** (Proventil) 2.5mg in 3mL **SALINE** NEB or **RACEMIC EPINEPHRINE 2.25%** (AsthmaNefrin) 0.05mL/kg in 3mL of **SALINE**, max dose of 0.5mL.

5. Transport. If patient is to be transported without intubation, have BVM and airway equipment at the head of the bed. Endotracheal intubation equipment should be open and prepared for immediate use if required.

6. Severe respiratory distress despite the above measures requires intubation. Consider intubating with a tube one full size smaller than would normally be used.

7. Consider inserting an NG tube for gastric decompression if intubated.

8. If necessary, restrain the patient to protect the ET tube. Agitation may be treated with **LORAZEPAM** (Ativan) 2-5mg IVP or **DIAZEPAM** (Valium) 2-10mg IVP as needed.

WARNING

Do not examine pharynx as this may cause laryngospasm in cases of epiglottitis.

9. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix G
Dyspnea of Unknown Origin

Characterization
Dyspnea as a secondary problem not otherwise identified in this SOP.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Obtain:

    a. 3 and 12 Lead electrocardiography record (ECG).

    b. Sp02 value.

    c. EtC02 value and waveform capnography record.

    d. Body temperature.

    e. Blood glucose level

3. Refer to General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for Cardiac Care and treat per appropriate algorithm.

4. Contact Medical Control for medication orders as needed.

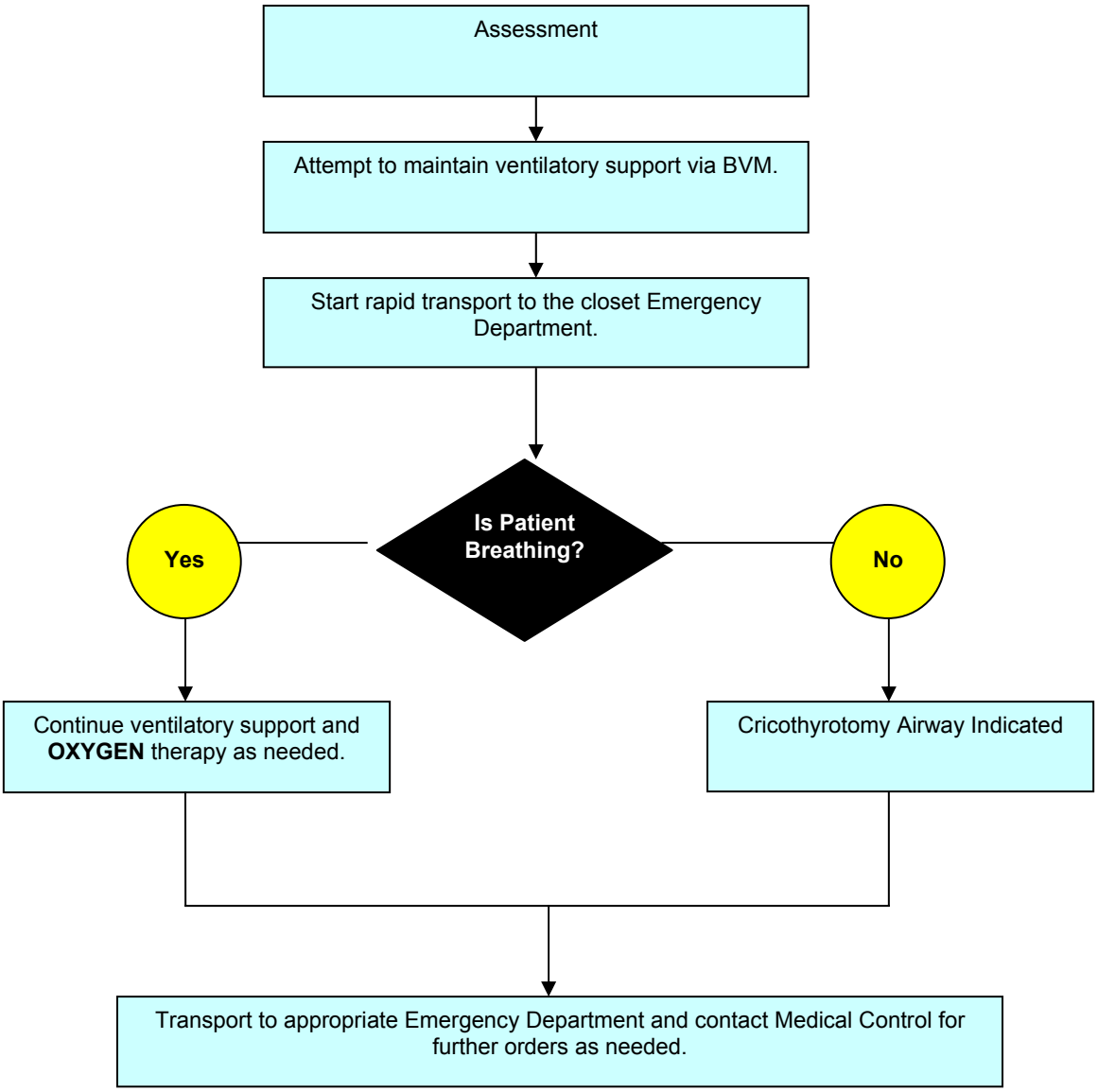
5. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix H
Failed Airway

Indications
Inability to establish and maintain a definitive airway of the "crashing" patient in the presence of apnea with impending respiratory arrest, cardiac arrest and/or death to patient if not immediately corrected.

Can only arrive at this protocol from awake/combative/clinching, failed RSI attempt or difficult airway intubation.

Treatment Procedure



Appendix I
Foreign Body Obstruction
(FBO)

Treatment Procedure

1. It is best not to do anything if the victim is coughing forcefully and not turning a bluish color. Ask, "Are you choking?" If the person is able to answer you by speaking, it is a partial airway obstruction. Stay with the person and encourage him or her to cough until the obstruction is cleared.

2. Do not attempt to hit the person on the back because this may only hamper the person's attempts to cough up the object.

3. Do not give the person anything to drink because fluids may take up space needed for the passage of air.

4. Someone who cannot answer by speaking and can only nod the head has a complete airway obstruction and needs emergency help.

5. The treatment for a choking person who begins to become cyanotic or stops breathing varies with the person's age. In adults, the Heimlich maneuver should be attempted. It may be forceful enough to clear the airway.

6. The quick, upward thrust of the Heimlich maneuver forces the diaphragm upward very quickly, making the chest cavity smaller. This has the effect of rapidly compressing the lungs and forcing air out. The rush of air out will force out whatever is causing the person to choke.

7. If Heimlich maneuver fails to relieve the FBO, a blind “Finger-Sweep” to remove FBO may be conducted in the adult patient.

8. If Heimlich maneuver and blind “Finger-Sweep” fails to relieve the FBO, direct laryngoscope with use of McGill Forceps for removal of foreign body airway obstruction should be performed.

9. If direct laryngoscope with use of McGill Forceps fails to relieve the FBO, use of “PERTRACH” non-surgical airway device must be considered to secure an airway.

10. If use of “PERTRACH” non-surgical airway device fails to provide an adequate airway, a surgical cricothyrotomy airway must be considered.

11. Once a definitive airway has been established, provide ventilatory assistances with high flow supplemental **OXYGEN**.

12. Treat other injuries/illnesses as appropriate, IAW prescribed SOP’s.

13. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix J
Hyperventilation Syndrome

Characterization

1. Hyperventilation occurs when a patient breathes at a rate faster than your normal breathing pattern or when they breathe more deeply than your body requires with each breath. Patients may not have any difficulty from breathing more deeply or at an increased rate, or they may have symptoms of hyperventilation.

2. Many people occasionally experience brief episodes of hyperventilation caused by stress or nervousness. Though scary, hyperventilation is usually mild and temporary. People experiencing this discomfort can usually control or prevent hyperventilation by managing stress and anxiety and by learning how to control your breathing.

3. Hyperventilation is usually triggered by a change in the natural balance of the gas exchange of OXYGEN (O_2) and carbon dioxide (CO_2) in the lungs. When breathing too deeply or too rapidly, patients exhale too much CO_2. When CO_2 levels decreases, the patient may feel anxious, which may then cause them to hyperventilate more. An increase in hyperventilation causes a further decrease in your CO_2 level, which may lead to more symptoms of hyperventilation.

4. Hyperventilation occurs most often in people who are nervous or tense, breathe shallowly, and have other medical conditions, such as lung diseases or panic disorder. Women experience hyperventilation more often than men. Most people who have problems with hyperventilation are between the ages of 15 and 55 years of age. Hyperventilation may occur when people travel to elevations over 6000 ft (1828.8 m). Symptoms can be similar to symptoms that are caused by another, more serious medical problem, such as a lung problem.

5. Acute (sudden) hyperventilation is usually triggered by acute stress, anxiety, or emotional upset. Chronic (recurring) hyperventilation may be triggered by a pattern of incorrect breathing. Chronic hyperventilation usually occurs when a physical or emotional event intensifies incorrect breathing patterns. Chronic hyperventilation may occur during pregnancy, but symptoms usually go away on their own after delivery.

6. Tightness in chest.

7. Normal to decreased Sp02 levels.

8. Painful or numbing carpel-tunnel spasms.

9. Decreased EtC02 levels.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Elevate head of the bed to the position of comfort.

3. Establish IV of **0.9% NORMAL SALINE** (0.9% NaCL.) and run at 20-30 cc/hr.

4. Transport to appropriate Emergency Department and contact medical control for further orders as needed.

Appendix K
Lung Cancer

Characterization
Lung Cancer is a disease that begins in the tissue of the lungs. The lungs are sponge-like organs that are part of the respiratory system. During breathing, air enters the mouth or nasal passage and travels down the trachea. The trachea splits into two sets of bronchial tubes that lead to the left and right lung. The bronchi branch off into smaller and smaller tubes that eventually end in small balloon-like sacs known as alveoli. The alveoli are where OXYGEN, carbon dioxide, and other substances are exchanged between the lungs and the blood stream.
The vast majority of Lung Cancer cases fall into one of two different categories:

Non-Small Cell Lung Cancer is the most common type of Lung Cancer, making up nearly 80% of all cases. This type of Lung Cancer grows and spreads more slowly than small cell lung cancer. Non-small cell lung cancer is divided into three different subcategories. Squamous cell carcinoma originates in the thin, flat cells that line the passages of the respiratory tract. Adenocarcinoma begins in the cells that form the lining of the lungs. Large cell carcinomas make up a group of cancers that look large and abnormal under a microscope.

Small Cell Lung Cancer makes up nearly 20% of all Lung Cancer cases. It is associated with cancer cells smaller in size than most other cancer cells. These cells may be small, but they can rapidly reproduce to form large tumors. Their size and quick rate of reproduction allows them to spread to the lymph nodes and to other organs of the body. This type of Lung Cancer is almost always caused by smoking or second hand smoke.

Symptoms
Symptoms of lung cancer vary depending on the type, location, and size of the tumor. Many people with lung cancer have no symptoms until the disease has advanced into late stages. Some lung cancer symptoms are similar to those of other common illnesses. Advise your physician of your medical and social history at each physical examination to assist in a prompt and accurate diagnosis.
When lung cancer does cause symptoms, they can include the following:

- Coughing (most common)
- Shortness of breath (dyspnea)
- Fatigue
- Wheezing
- Pain in the chest, shoulder, upper back, or arm
- Coughing up blood (hemoptysis)
- Repeated pneumonia or bronchitis
- Loss of appetite (anorexia) and weight loss
- General pain
- Hoarseness
- Swelling of face or neck
- Pleural effusion

Some symptoms occur when the cancer spreads to other parts of the body. This spread is referred to as metastasis. Lung cancer can metastasize to the liver, the brain or the bones.
Symptoms for metastases can include the following:

Brain	Liver	Bone
Headaches Seizures Nausea Vomiting Weakness	Stomach pain (right side) Jaundice	Bone Pain

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Elevate head of the bed to the position of comfort.

3. Establish IV of **0.9% NORMAL SALINE** (0.9% NaCL.) and run at 20-30 cc/hr.

4. Refer to General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for: **PAIN & DISCOMFORT** for patients with pain and discomfort secondary to their cancer related illness.

5. Transport to appropriate Emergency Department and contact medical control for further orders as needed.

Appendix L
Pneumonia

Characterization

1. Pneumonia is an inflammation of the lungs most often caused by infection with bacteria or a virus. Pneumonia can make it hard to breathe because the lungs have to work harder to get enough OXYGEN into the bloodstream.

2. Symptoms of pneumonia caused by bacteria often begin suddenly and may follow an upper respiratory infection, such as influenza (flu) or a cold. Common symptoms include fever, a cough that often produces colored mucus (sputum) from the lungs, and rapid, often shallow breathing.

3. Older adults may have different, fewer, or milder symptoms. The major sign of pneumonia in older adults may be a change in how well they think (confusion or delirium) or a worsening of a lung disease they already have.

4. Symptoms of pneumonia not caused by bacteria (nonbacterial) include fever, cough, and shortness of breath, and there may be little mucus production.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Consider the administration of:

   a. **ALBUTEROL** (Proventil) 2.5mg in 3cc of **SALINE** NEB. May repeat this dose every five to ten minutes up to 3 doses. If patient does not respond then consider:

   b. **IPRATROPIUM BROMIDE** (Atrovent) 0.5mg with **ALBUTEROL** (Proventil) 2.5mg NEB with no **SALINE**. May repeat this dose every five to ten minutes as needed.

3. Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL.).

4. Transport to appropriate Emergency Department and contact Medical Control for further orders as needed.

Appendix M
Pulmonary Edema

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Determine level of respiratory distress due to Pulmonary Edema (PE). Level: Mild, Moderate or Severe. Provide treatment IAW with level of severity.

MILD	MODERATE	SEVERE
Characterized By	**Characterized By**	**Characterized By**
► Patient able to speak. ► Lung sounds may have lower lobe rails (crackling). ► Sp02 saturations 95-99%. ► Normal EtC02 Levels. ► Normal skin color.	► Patient may speak in broken phrases. ► Sp02 saturations 90-95%. ► Normal or elevated EtC02 levels. ► Rails or diminished lower lobe lung sounds. ► May have Rhonchi (wet) upper lobe lung sounds. ► May have cyanotic nail beds and ears. ► Compensated shock.	► Patient has very noticeable trouble speaking or is unable to speak. ► Tightness in chest. ► Sp02 saturations less than 90%. ► Normal or elevated EtC02 levels. ► Sever wheezing to diminished or absent lung sounds. ► May have cyanotic nail beds, nose and ears. ► Patient sitting in a Tri-Pod position. ► Patient uses accessory muscles to breath. ► De-compensated shock. ► Patient does not respond to treatment for mild to moderate distress.

Treatment	
Mild to Moderate	**Severe**
► Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL.) utilizing 60gtt tubing. ► Consider the following pharmaceutical interventions: **NITROGLYCERIN SPRAY** 0.4mg SL. May repeat ×2 as needed. **MORPHINE SULFATE** 2-4mg IVP. May repeat ×1 as needed. Titrate to SBP ≤ 90mm/Hg. Contact Medical Control if additional repeat doses of **MORPHINE** are needed. **FUROSIMIDE** (Lasix) 20 – 40mg IVP. ► If patient does not respond well to treatment, reassess and continue to "severe".	► Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL.) utilizing 60gtt tubing. ► If patient presents with hypotension (SPB: >90mm/Hg), consider **DOPAMINE** 2 – 20mcg/kg/min. **NITROGLYCERIN**, **MORPHINE SULFATE** and/or **FUROSIMIDE** (Lasix) should not be administered in the presence of hypotension. ► Consider the following pharmaceutical interventions: **NITROGLYCERIN SPRAY** 0.4mg SL. May repeat ×2 as needed. **MORPHINE SULFATE** 2-4mg IVP. May repeat ×1 as needed. Titrate to SBP ≤ 90mm/Hg. Contact Medical Control if additional repeat doses of **MORPHINE** are needed.

Treatment Continued	
Mild to Moderate	**Severe**
► Refer to General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for Cardiac Care and treat per appropriate algorithm. ► Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.	**FUROSIMIDE** (Lasix) 40mg IVP. May repeat ×1. Contact Medical Control if additional doses are needed. Pre-Hospital **FUROSIMIDE** (Lasix) should not exceed 120mg. ► **NITROGLYCERIN IV** (Tridil) 10 – 20mcg/min IVPB. ► Consider initiating Continuous Positive Air Pressure (CPAP). ► Consider endotracheal intubation ventilation. If patient is conscious, consult with Medical Control prior to initiating RSI procedures. **NOTE**: Advanced level providers should give considerations to patient's ability to be "weaned" off of mechanical ventilator prior to electing to conduct endotracheal intubation. When possible, Medical Control should be consulted prior to this procedure. ► Refer to General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for Cardiac Care and treat per appropriate algorithm. ► Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.

Appendix N
Pulmonary Embolism

Characterization

1. Pulmonary embolism is the sudden blockage of an artery in the lung. Once the artery is blocked, usually by one or more blood clots, OXYGEN levels in the blood drop, and blood pressure in the lungs rises.

2. Pulmonary embolism caused by large clots can cause sudden death, usually within 30 minutes of when symptoms begin. Smaller clots may cause permanent damage to the heart and lungs.

3. The most common cause of pulmonary embolism is a blood clot that forms in a deep vein in your leg, breaks loose, travels to the lungs, and becomes trapped in one of the smaller lung arteries. Other substances, such as tumors, air bubbles, amniotic fluid, or fat that is released into the blood vessels, may also block an artery, but such causes are rare.

Treatment Procedure

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Treatment of pulmonary embolism focuses on preventing future pulmonary embolism by using anticoagulant medications. Anticoagulants prevent existing blood clots from growing larger and help prevent new ones from developing. Contact Medical Control and consider **HEPARIN** (Calcilean) 5000U – 7500U IVP, then IVPB infusion at 1000U/hour.

3. If symptoms are severe and life-threatening, immediate and sometimes aggressive treatment is needed. Aggressive treatment may include thrombolytic medications, which can dissolve a blood clot quickly but also increase the risk of severe bleeding. Another option for life-threatening, large pulmonary embolism is surgical removal of the clot, called an embolectomy. In any case, neither of these treatment options are available in the out-of-hospital setting.

4. Provide supportive care as needed.

5. Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.

Appendix O
Reactive Airway Disease

Indications
Asthma, Status Asthmatics, Chronic Obstructive Pulmonary Disease (COPD), Emphazemia

Treatment Procedures

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Determine level of respiratory distress due to Reactive Airway Disease (RAD). Level: Mild, Moderate or Severe. Provide treatment IAW with level of severity.

MILD	MODERATE	SEVERE
Characterized By	**Characterized By**	**Characterized By**
► Patient able to speak. ► Tightness in chest. ► Sp02 saturations 95-99%. ► Normal EtC02 Levels. ► Wheezing lung sounds. ► Normal skin color.	► Patient speaks in broken phrases. ► Tightness in chest. ► Sp02 saturations 90-95%. ► Normal or elevated EtC02 levels. ► Wheezing to diminished lung sounds. ► May have cyanotic nail beds and ears. ► Patient does not respond to treatments for mild distress.	► Patient has very noticeable trouble speaking or is unable to speak. ► Tightness in chest. ► Sp02 saturations less than 90%. ► Normal or elevated EtC02 levels. ► Sever wheezing to diminished or absent lung sounds. ► May have cyanotic nail beds, nose and ears. ► Patient sitting in a Tri-Pod position. ► Patient uses accessory muscles to breath. ► Patient does not respond to treatment for mild to moderate distress.
Treatment	**Treatment**	**Treatment**
► In conjunction with **OXYGEN**, consider the administration of: Administration of **ALBUTEROL** (Proventil) 2.5mg in 3mL **SALINE** PRN. Administration of **ATROVENT** (Ipratropium) 0.5mg with **ALBUTEROL** 2.5mg with no **SALINE** bullet PRN. ► Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL). ► If patient does not respond well to treatment, reassess and continue to “moderate”.	► Consider the following pharmaceutical interventions: Administration of **TERBUTALINE SULFATE** (Brethine) 0.25mg SQ × 2. Administration of **EPINEPHRINE 1:1000** SQ 0.3-0.5mg. may repeat × 2 as needed. ► Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL). ► In conjunction with **OXYGEN**, consider the administration of:	► Consider the following pharmaceutical interventions: Administration of **TERBUTALINE SULFATE** (Brethine) 0.25mg SQ × 2. Administration of **EPINEPHRINE 1:1000** SQ 0.3-0.5mg × 2. ► Establish IV access with **0.9% NORMAL SALINE** (0.9% NaCL). ► Consider the Administration of **THEOPHYLLINE** (Aminophylline) Infusion 250mg/100cc over 20-30 minutes ×1.

Treatment Continued		
Mild	**Moderate**	**Sever**
► Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.	► Consider the administration of **ALBUTEROL** (Proventil) 2.5mg in 3mL **SALINE** PRN. ► Consider the administration of **ATROVENT** (Ipratropium) 0.5mg with Albuterol 2.5mg with no saline bullet PRN. ► If patient does not respond well to treatment, reassess and continue to "moderate". ► Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.	► Consider the administration of **ALBUTEROL** (Proventil) 2.5mg in 3mL **SALINE** PRN. ► Consider the administration of **ATROVENT** (Ipratropium) 0.5mg with Albuterol 2.5mg with no saline bullet PRN. ► Consider endotracheal intubation ventilation. **NOTE**: Advanced level providers should give considerations to patient's ability to be "weaned" off of mechanical ventilator prior to electing to conduct endotracheal intubation. When possible, Medical Control should be consulted prior to this procedure.

Appendix P
Respiratory Arrest

Procedures

1. Perform initial assessment.

2. If ventilatory status is inadequate, (patient is cyanotic, visible retractions, severe use of accessory muscles, altered mental status, respiratory rate less than 10 breaths per minute, signs of poor perfusion) Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

3. If ventilations are unsuccessful, refer immediately to the Foreign Body Airway guidelines.

4. If the patient is in cardiac arrest refer to General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for: **CARDIAC CARE**.

5. Ventilate with high concentration **OXYGEN**.

6. Request Advanced Life Support if available.

7. Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.

CAUTION

If signs of impending cardiac arrest (i.e., progressive bradycardia, delayed capillary refill [greater than 2 seconds], cyanosis and limp muscle tone), be prepared to initiate the appropriate Cardiac Arrest Protocol.

Adequate ventilation may require disabling the pop-off valve if the bag-valve-mask unit is so equipped.

Appendix Q
Spontaneous Pneumothorax

Characterization

1. Acute dyspnea (severe).
2. Unilaterally absent or severely diminished breath sounds on the affected side.
3. Subcutaneous emphysema.
4. Signs and symptoms of shock without other apparent cause.
5. Mediastinal shift with tracheal deviation (late sign).
6. Distended neck veins. (JVD).
7. Hyperresonant percussion (usually difficult in the pre-hospital setting).

Treatment Procedures

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.
2. Place patient in position of comfort, usually upright (only if cervical-spine injury has been ruled out).
3. Assess patient's chest and respiratory excursions.
4. Bare the chest and observe chest wall movement, ventilatory efforts, accessory muscles, agitation and anxiety.
5. Auscultate breath sounds in all fields.
6. Palpate the chest wall and check for symmetry of chest wall movement.
7. If assisted ventilation in progress, check for resistance when ventilating.
8. Identify (palpate) the second intercostal space, in the mid clavicular line on the side of the pneumothorax.
9. Prep the site with **PROVIDINE IODINE** (do not palpate site after prepped).
10. Attach 14ga 1-1/4" catheter snugly to a syringe or prepare TURKLE needle.
11. Insert needle into the skin and direct the needle over the third rib.
12. Puncture the parietal pleura.
13. Aspirate as much air as necessary to relive the patient's acute symptoms.
14. Advance the catheter in place and apply a bandage or small dressing.
15. Reassess chest, respiratory excursion and vital signs.
16. Observe chest wall movement ventilatory effort, accessory muscles, agitations/anxiety.
17. Ventilate with **OXYGEN** 15Lpm assisting with ventilations if needed.
18. Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.

Appendix R
Toxic Inhalation

Special Considerations
The effect of inhaling toxic gases depends on the extent and duration of exposure and on the specific irritant. Toxic exposures predominantly affect the airways, causing tracheitis, bronchitis, and bronchiolitis.

Acute Exposure

1. Acute exposure to high concentrations of toxic gas over a short time is characteristic of industrial accidents resulting from a faulty valve or pump in a gas tank or during gas transport. Many people may be exposed and affected. Chlorine, phosgene, sulfur dioxide, hydrogen chloride or sulfide, nitrogen dioxide, ozone, and ammonia are among the most important irritant gases.

2. Respiratory damage is related to the size of inhaled particles and the solubility of the gas. More water-soluble gases (e.g., chlorine, ammonia, sulfur dioxide, hydrogen chloride) immediately cause mucous membrane irritation, which may alert the victims to the need to escape the exposure. Permanent damage to the upper respiratory tract, distal airways, and lung parenchyma occurs only if the victim's escape from the gas source is impeded. Less soluble gases (e.g., nitrogen dioxide, phosgene, ozone) do not produce early warning signs and are more likely to cause severe bronchiolitis, with or without pulmonary edema. In nitrogen dioxide intoxication (as occurs in silo fillers and welders), a lag of up to 12 hours may occur before symptoms of pulmonary edema develop.

Symptoms, Signs and Diagnosis

1. Soluble irritant gases cause severe burning and other manifestations of irritation of the eyes, nose, throat, trachea, and major bronchi. Marked cough, hemoptysis, wheezing, retching, and dyspnea are common. Severity is generally dose-related.

2. Nonsoluble gases cause fewer immediate symptoms but can present with dyspnea or cough. Diagnosis is usually obvious from the history; management does not differ by specific inhaled agent but rather by symptoms. The upper airway may be obstructed by edema, secretions, and/or laryngospasm.

CRITICAL INFORMATION

Evidence of any of these secondary to toxic inhalation injuries indicates a need for prophylactic endotracheal intubation.

Prognosis

1. Most people recover fully. Bacterial infections, which are common, are the most serious complication. A few develop acute respiratory distress syndrome (ARDS), usually within 24 hours. Bronchiolitis obliterans progressing to respiratory failure can develop 10 to 14 days after acute exposure to ammonia, nitrogen oxides, sulfur dioxide, and mercury. This pattern of injury is associated with airflow obstruction mixed with restriction. Bronchiolitis obliterans with organized pneumonia can ensue when granulation tissue accumulates in the terminal airways and alveolar ducts during the body's reparative process. ARDS without or with late pulmonary fibrosis may develop in a minority of cases.

2. Occasionally, heavy exposures lead to reversible airway obstruction (reactive airways dysfunction syndrome) persistent for ≥ 1 years, resolving slowly in some cases. Smokers may be more susceptible to persistent toxin-related lung injury. Injuries to the lower airways can obstruct airflow long-term, especially after exposures to ammonia, ozone, chlorine, and gas mixtures.

Treatment Procedures

1. Immediate management includes removal from exposure, observation, and supportive care.

2. If possible, the victim should be moved into fresh air.

3. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

4. Treatment is directed toward maintaining sufficient gas exchange by ensuring adequate Oxygenation and alveolar ventilation.

5. Severe airflow obstruction is managed with inhaled **RACEMIC EPINEPHRINE 2.25%** (AsthmaNefrin) 0.05mL/kg in 3mL of **SALINE**, max dose of 0.5mL, endotracheal intubation or tracheostomy, and mechanical ventilation, if necessary.

6. Bronchodilators such as:

   a. **ATROVENT** (Ipratropium) 0.5mg with **ALBUTEROL** (Proventil) 2.5mg NEB with no **SALINE** bullet PRN; or

   b. **ALBUTEROL** (Proventil) 2.5mg in 3mL **SALINE** NEB every 3-5 minutes PRN and **OXYGEN** therapy may suffice in less severe cases.

7. After the acute phase has been managed, paramedics must remain alert to the development of reactive airways dysfunction syndrome, bronchiolitis obliterans with or without organized pneumonia, pulmonary fibrosis, and delayed-onset ARDS.

8. Because of the risk of ARDS, any patient with acute upper airway injury after inhalation of toxic aerosols or gases should be admitted to the hospital for observation.

9. Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.

Appendix S
Upper Respiratory Infection
(URI)

Characterization

1. An URI is any type of infection of the head and chest that is caused by a virus. It can affect your nose, throat, sinuses and ears. It could also affect the tube that connects your middle ear and throat, and your windpipe, voice box and airways.

2. Viruses are germs that cause infections. Over 200 viruses can cause URIs. The infection is spread when viruses are passed to others by sneezing, coughing, or personal contact.

3. Persons may also become infected by handling objects that were touched by someone with an URI.

Symptoms May Include

1. Scratchy or sore throat.

2. Sneezing, runny nose, and nasal congestion.

3. Cough.

4. Watery eyes.

5. Ear congestion.

6. Slight pyrexia (99 to 100ºF or 37.2 to 37.8ºC).

7. Fatigue.

8. Headache.

9. Loss of appetite.

Treatment Procedures

1. Secure airway as per AIRWAY ASSESSMENT algorithm and provide supplemental **OXYGEN** as needed.

2. Place patient in position of comfort.

3. Treat any underlying injuries/illnesses IAW the appropriate SOP.

4. Transport to appropriate Emergency Department and contact Medical Control for additional orders as needed.

Annex A
OXYGEN Saturation Monitoring

Indications

1. All advance life support patients.
2. Extremity fractures.
3. Any patient with respiratory distress.
4. Any patient with chest pain.

Precautions

1. Accuracy is dependant upon adequate perfusion at probe site.
2. Can be affected by bright light, carbon monoxide poisoning, cyanide poisoning, nail polish & polycythemia.

Procedure

1. Find Suitable Location for Probe (Finger, Earlobe, Pediatric probe, Bridge of nose etc.).
2. Attach and record readings.
3. May be used to monitor circulation distal to injuries.
4. If erratic reading, move probe to different site.

Annex B
Capnometry/Capnography (EtC02) Monitoring

Indications

1. All intubated patients.

2. Patients with respiratory problems or complaints.

Precautions

1. Filter must be attached to unit bezel before unit is turned on.

2. Filters may become clogged during use.

3. It is suggested that extra filters be readily available.

Procedure

1. Attach filter with tubing to bezel/monitor.

2. Turn on unit.

3. On the intubated patient, disconnect the BVM or Autovent from the ET tube.

4. Place the ET tube sensor on the top of the ET tube and reconnect BVM or Autovent to the top of the adapter.

5. Resume ventilation and record capnometry reading.

6. Normal EtC02 range is 35 - 45 mm/hg.

7. In cases of cardiac arrest or other poor perfusion states, the EtC02 reading could be very low. In these cases, the presence of EtC02 and the bar scale changing with each ventilation confirms EtC02.

8. For non-intubated patients utilize nasal cannula device or place the ET Tube sensor between BVM and mask.

9. Head Injured patients with suspected intracranial pressure should be ventilated to an EtC02 level of no less than 30 mm/hg.

Annex C
Nasopharyngeal Airway

Indications

1. Conscious or semiconscious patients unable to control their airway.
2. Clinched jaws.
3. Altered level of consciousness with a gag reflex.

Exclusion Criteria
None

Supportive Data
The nasopharyngeal airway (trumpet) is used to maintain a patent airway to the hypopharynx. It is most commonly used in the semiconscious patient to facilitate the removal of tracheo-bronchial secretions by directing the suction catheter and by averting tissue trauma that is associated with repeated suction attempts. The bevel-shaped pharyngeal end of the airway facilitates insertion, and its funnel-shaped nasal end helps present slippage.

Contraindications

1. Fluid or blood from the ears or nose.
2. Basilar skull fracture.
3. Facial/nasal trauma.
4. Head trauma where basilar skull fracture or cranial vault communication is suspected.
5. Epistaxis/history of epistaxis.
6. Bleeding tendencies, history of taking warfarin or heparin.
7. Obstructed nasal passageways, i.e., nasal polyps, packing

Procedure

1. Pre-Oxygenate the patient if possible.
2. Measure the tube from the tip of the nose to the earlobe.
3. Lube the airway with water soluble jelly.
4. Insert tube (right nare first) with bevel of tube towards the septum, angling towards the base floor of the nasopharynx, reassess the airway.
5. If patient needs ventilatory support, a 7.5 mm ET adapter can be inserted into the airway and used with a BVM.

Annex D
Oropharyngeal Airway

Criteria
To outline the steps in performing the insertion of an oropharyngeal airway.

Indications
Unconscious patients unable to control their airway.

Contraindications

1. Conscious or semiconscious patient.

2. Patient with an active gag reflex.

Procedure

1. Select a proper sized airway. This is done by placing the airway against the patient's face. A correctly sized airway will extend from the patient's mouth to the angle of the jaw.

2. Open the patient's mouth with the chin lift maneuver.

3. Insert the oral airway upside down, so its concavity is directly upward, until the soft palate is reached. At this point the airway is rotated 180 degrees, the concavity is directed inferiorly and the airway is slipped into place over the tongue. In children it is better to depress the tongue with a spatula before inserting the airway in the correct position. The airway must not push the tongue backward and therefore block the airway.

4. Ventilate patient as necessary.

Annex E
Esophageal Tracheal Airway
(Combi-Tube)

Indications
Respiratory arrest. Cardiac arrest. Unresponsive patients without gag reflex.

Contraindications
Under age 16. Under 5ft. tall. Known esophageal disease. Caustic substance ingestion. Gag reflex.

Procedure

1. Universal precautions.
2. Assure patient is being ventilated with BVM and OPA.
3. Assemble and Check equipment.
4. Hyper-Oxygenate the patient prior to insertion.
5. Place the head in a neutral position; maintain cervical spine control on all trauma patients.
6. Grasp the tongue and jaw and lift up.
7. Insert the tube into hypo-pharynx until the teeth are between the black lines.
8. Inflate the #1 hypo-pharynx cuff with 100cc of air using the blue port.
9. Inflate the #2 esophageal cuff with 15cc of air using the white port.
10. Attach BVM at the #1 esophageal (blue) tube and ventilate the patient, looking for chest rise.
11. Auscultate for lung sounds and epigastric sounds.
12. If no lung sounds are heard, but epigastric sounds are present ventilate through the #2 (clear) tracheal tube.
13. Reassess lung sounds and epigastric sounds. Confirm with capnography.
14. Continue BVM ventilation, head tilt, chin lift should be maintained unless contraindicated. (C-spine).

Removal Process

1. Have suction ready with a large bore catheter.
2. Deflate the hypo-pharynx cuff, move tube to left side of oral pharynx.
3. Intubate patient and confirm placement per intubation procedure with appropriate devices and capnography.
4. Deflate Esophageal cuff, be prepared to suction immediately.
5. Remove Combi-Tube.
6. Continue ventilation’s via ET tube and reconfirm placement.

Annex F
Continuous Positive Airway Pressure
(CPAP)

Indications

1. All adult patients requiring ventilatory assistance via the adult CPAP generator, WhisperFlow, fixed flow output generator.

2. Application of positive end expiratory pressure by face mask for relief of hypoxemia that doesn't respond to conventional therapy. Patient must be able to adequately ventilate spontaneously.

3. Hypoxemia secondary to Congestive Heart Failure and/or Pulmonary Edema.

4. Short-term management of acute respiratory failure in an awake cooperative patient.

5. Near drowning patient. (Awake and cooperative)

Contraindications

1. Patient is unable to protect their airway.

2. Need for immediate Intubation.

3. Ventilatory failure.

4. Gastric distention.

5. Claustrophobia.

6. Penetrating chest trauma.

7. Severe hypotension.

8. Persistent nausea/vomiting.

9. Obtundation.

10. Questionable ability to protect airway, i.e. stroke obtundation, etc.

Precautions

1. Requires patient cooperation. The major complication is the inability to tolerate the mask; in which case the mask should be removed and an alternate airway should be instituted)

2. If patient complains of nausea remove mask. The mask may be held in place manually. Vomiting with the mask in place virtually guarantees aspiration.

3. Adequate supply of OXYGEN is required.

Procedure

1. Assess vital signs, attach monitor, pulse oximetery (Sp02) and capnometry (EtC02).

2. If SBP <100mm/Hg contact Medical Control prior to beginning CPAP.

3. Select the appropriate PEEP valve.

a. Moderate distress: 5cm/H2O pressure.

b. Severe distress: 10cm/H2O pressure.

4. Connect the generator to 50psi **OXYGEN** outlet and turn flow control six to seven full turns counterclockwise.

5. Attach OXYGEN analyzer.

6. Begin at 100%Fi02.

7. Adjust Fi02 to patient's **OXYGEN** saturation (i.e. for patient with **OXYGEN** saturation in the 80's begin at 100% Fi02 and decrease level as saturation rises). Titrate Fi02 to maintain **OXYGEN** saturation >95%.

8. Treatment should be given continuously throughout transport to Emergency Department.

9. Vital-Signs every five (5) minutes.

10. In case of life-threatening complications:

a. Stop treatment.

b. Offer reassurance.

c. Institute Advanced Life Support (ALS) per appropriate EMS protocols.

d. Adverse reactions to therapy are to be documented. The paramedic should immediately notify Medical Control and Emergency Department staff upon arrival.

11. Documentation in the EMS Patient Care Report narrative should include:

a. PEEP Level.

b. Fi02.

c. Vital signs every five (5) minutes.

d. Effects/adverse reactions.

e. **OXYGEN** saturation (Sp02).

Annex G
Laryngo-Tracheal Anesthesia
(LTA)

Criteria

1. To facilitate intubations in the patient with laryngospasm.

2. To reduce the risks of laryngospasm in the breathing patient.

Precautions

1. Should be done under direct visualization.

2. Cricoid pressure should be applied until the endotracheal tube is secured in place.

3. Dosage of **LIDOCAINE** used not to exceed 3mg/kg.

Contraindications

1. Known allergy to **LIDOCAINE**.

2. Heart blocks.

Procedure

1. Universal precautions.

2. Have an assistant standing by to help.

3. Hyperventilate the patient for 2 minutes.

4. Assemble the LTA catheter to the bristoject.

5. Under direct visualization, advance the LTA catheter through the vocal cords until the black line on the catheter is at the glottis opening.

6. Administer the **LIDOCAINE 4% TOPICAL SOLUTION** through the catheter to spray the entire glottis and subglottic area.

7. Have an assistant apply cricoid pressure while the patient is hyperventilated for 2 minutes.

8. Perform the intubation procedure.

9. Assess tube placement and secure tube.

10. Release cricoid pressure and continue ventilation.

11. Document all the above.

Annex H
Rapid Sequence Intubation
(RSI)

Criteria
Patient requiring sedative and/or neuromuscular blocking agent therapy to facilitate intubation.

Indications

1. A critical need for airway control exist, such as:
    a. Persons with impending respiratory failure.
    b. Combative patients with compromised airway.
    c. Patients with depressed LOC. GCS < 8.
    d. Patient with hypoxia refractory to **OXYGEN**.
    e. Multiple trauma patient who requires a definitive airway.
2. Any time risk of potential/actual airway compromise is suspected.

Exclusion Criteria

1. Absolute contraindications.
    a. Patients in whom cricothyrotomy would be difficult or impossible.
    b. Massive neck trauma/swelling.
    c. Patients who would be impossible to intubate or ventilate after paralysis.
    d. Acute epiglottitis.
    e. Upper Airway Obstruction.
2. Relative contraindications.
    a. Benefit of airway control must be weighed against risk.
    b. Hypersensitivity to drugs

Procedure

NOTE

Patient has been identified as requiring sedative and/or neuromuscular blocking agent therapy to facilitate intubation.

1. If time and patient condition allows, contact Medical Control for physician consult prior to initiating RSI therapy.

2. Assuring all the following are in place prior initiating RSI therapy:
    a. Patient is receiving 100% **OXYGEN**.

b. Suction.

c. Sp02.

d. Wave-form EtC02 or digital electronic EtC02 detector readily available.

e. 3 Lead Electrocardiograph.

f. Patent IV line.

g. Appropriate Drugs (drawn in syringes).

h. Intubation equipment checked and ready for use.

i. "Back-Up" plan ready to use in the event of intubation attempt failure (Failed Airway).

WARNING

When utilizing RSI procedures, even with adequate sedation, the patient may still be aware of the situation. Inform patient of any procedures you will be performing, just as you would in a conscious patient.

3. Assemble necessary equipment and personnel.

4. Position patient properly.

5. Allow patient to breathe 100% **OXYGEN** for 4-5 minutes if possible, or ventilate patient with BVM with 100% **OXYGEN** for 1 to 2 minutes.

6. Does patient have confirmed or suspected head injury or ICP?

   a. If YES, then:

      (1) **LIDOCAINE** 1.5mg/kg IVP × 1.

   b. If NO, then resume at procedure #7.

7. Does patient have confirmed bradycardia?

   a. If YES, then:

      (1) **ATROPINE** 0.5 – 1mg IVP. Repeat as needed to a max dose of 3mg.

   b. If NO, then resume at procedure #8.

8. Select & administer one of the sedatives below:

   a. **ETOMIDATE** (Amidate) 0.35mg/kg IVP.

   b. **MIDAZOLAM HCl** (Versed) 2-10mg IVP.

   c. **DIAZEPAM** (Valium) 2-10mg IVP.

   d. **LORAZEPAM** (Ativan) 2-4mg IVP.

9. Select & administer one of the following chemical paralysis medications:

a. **SUCCINYCHOLINE CHLORIDE** (Anectine) 1 – 1.5mg/kg IVP over 30 – 60 seconds, in conjunction with sedative to optimize ventilation and to protect the airway.

b. **ZEMURON** (Rocuronium Bromide) 1mg/kg IVP, in conjunction with sedative to optimize ventilation and to protect the airway.

c. **NORCURON** (Vecuronium) 0.08-0.1mg/kg IVP, (then 0.01-0.015mg/kg for prolonged procedures) in conjunction with sedative to optimize ventilation compliance and to protect the airway for patients who require ongoing paralytic interventions during prolonged inter-facility transports.

10. Allow patients to breathe spontaneously with high flow **OXYGEN** via a non-rebreather mask until paralysis ensues.

11. If paralytics are ineffective, check IV site for patency and repeat dose of:

a. **SUCCINYCHOLINE CHLORIDE** (Anectine) 1 – 1.5mg/kg IVP over 30 – 60 seconds.

b. **ZEMURON** (Rocuronium Bromide) 1mg/kg IVP.

c. **NORCURON** (Vecuronium) 0.08-0.1mg/kg IVP one time in a patent IV line.

12. Attempt intubation. If unable to intubate in the first 60 seconds stop and ventilate the patient with BVM for 30 seconds and repeat intubation attempt. If endotracheal intubation remains unsuccessful, stop and ventilate the patient with BVM for 30 seconds and repeat intubation attempt. If endotracheal intubation remains unsuccessful, ventilate patient using a simple airway adjunct (Oropharyngeal Airway or Nasal-pharyngeal Airway) and BVM.

13. Consider non-surgical cricothyroidotomy device or contact Medical Control and consider surgical cricothyroidotomy for patients weighing at least 40kg. For patients who weigh less than 40kg, contact Medical Control and consider a needle cricothyroidotomy.

14. Inflate cuff, assess tube placement, and confirm proper position. Re-assess for breath sounds and air in the stomach then confirm ET tubes placement using procedures noted in Annex A of this SOP.

15. Ventilate patient as appropriate with BVM or Autovent as needed to maintain EtC02 values of 35 – 45mg/Hg with 100% **OXYGEN**.

16. Reassess tube placement, lung sounds, EtC02 values, Capnograph wave-forms, Sp02 and ECG often (at least every 3 to 5 minutes) and modify treatment as appropriate.

17. Document all of the above and continue patient care.

Annex I
Orotracheal Intubation

Criteria

1. Cardiac arrest.

2. Patient with inadequate ventilations that requires manual ventilation by EMS personnel.

3. Patient who is unable to maintain a patent airway with nasopharyngeal or oropharyngeal airways.

Exclusion Criteria
In pediatric patients, ventilation with BVM may be the preferred method of ventilation and airway maintenance if the ETA to hospital is short and ventilation by BVM is adequate.

Procedure

NOTE

Refer to Annex H (Rapid Sequence Intubation (RSI) if patient requires sedatives and/or neuromuscular blocking agent therapy to facilitate orotracheal intubation.

1. Assemble the equipment while providing maximal OXYGEN and continuing ventilation. Choose tube and blade size (see Table 1 below).

TABLE 1

Orotracheal Tube Size Table
Age Endotracheal Tube (uncuffed)

AGE	ETT SIZE
Premature	2.5 to 3.0
Newborns	2.5 to 3.0
2 ½ to 3 Months	3.5
18 Month	4.0
3 Years	4.5
5 Years	5.0
8 Years	6.0
10 to 15 Years	6.5 to 7.0
Adult	7.0 to 9.0

Laryngoscope Blade Size Table
Age Laryngoscope Blade Size

Premature	0 Straight
Term-1 Year	1 Straight
1-1½ Year	1½ Straight
1½-12 Years	1½ Straight
13+ Years	3 Curved

NOTE
Paramedics may also utilize Browslow® system to determine appropriate ET tube size in infants and children

2. Introduce the stylet and be sure it stops 1cm short of the tube's end. Test balloon with 5-10mL syringe full of air.

3. Assemble laryngoscope and check light.

4. Connect and check suction.

5. Position patient: neck flexed forward, head extended back. Back of head should be level with or higher than back of shoulders.

NOTE
Neck should not be extended or flexed if cervical spine injury is suspected. In this case, intubation should be attempted with in-line cervical stabilization by another individual while neck is kept in a neutral position. During in-line stabilization, the cervical collar may be opened to permit better jaw mobility and improved visualization.

6. Ventilate prior to intubation, but avoid high volumes and overzealous ventilation. Two person BVM technique with cricoid pressure is preferred.

NOTE

A second rescuer should initiate and maintain Sellick's maneuver (cricoid-pressure) until OPA has been secured.

7. Insert laryngoscope to right of midline. Move it to midline, pushing tongue to left and out of view.

8. Lift straight up on blade (no levering on teeth) to expose posterior pharynx.

9. Identify epiglottis: tip of curved blade should sit in vallecula (in front of epiglottis), straight blade should lift epiglottis.

10. Gently lift blade to expose glottis, identify trachea by arytenoids and vocal cords.

11. External laryngeal manipulation (by the intubator's right hand, generally in a backward, upward, and rightward direction) of the thyroid cartilage may dramatically improve the visualization of the glottic opening.

12. Insert tube from right side of mouth, along blade into trachea under direct vision.

13. Advance tube so cuff is 2-3 cm beyond cords.

14. Confirm placement and adequate ventilation.

15. Inflate cuff with 5-10 mL of air.

16. Check for air leaking at mouth after cuff is inflated.

17. Secure tube using woven twill tape or commercial device.

18. Reconfirm tube placement.

Notes

1. In children, a length-based reference tape is the preferred method of determining tube and equipment sizes. Other methods include the formula of ETT size = [(age/4) + 4].

2. Endotracheal intubation is NOT the procedure of choice in the first minutes of resuscitation. It is a secondary procedure only. Most persons can be adequately ventilated with mouth-to-mask or BVM with oropharyngeal or nasopharyngeal airway. If the number of personnel is limited, defibrillation, good chest compressions with minimal interruption, and establishing an IV take precedence over intubation if the patient can be ventilated adequately.

3. An intubation attempt is defined by the insertion of the laryngoscope blade into the mouth passed the teeth or alveolar ridge. Every insertion of the blade should be considered an intubation attempt. Number of attempts must be documented.

4. Any dentures or partial dental plates should be removed prior to laryngoscopy.

5. Intubation should take no more than 15-20 seconds to complete: do not lose track of time. If visualization is difficult, stop and re-ventilate before trying again. If intubation is not successful after 3 attempts, follow the Difficult Airway Algorithm and proceed to appropriate rescue or alternative device.

6. If a patient's condition deteriorates, consider possible complications, such as:

   a. Esophageal intubation: particularly common when tube not visualized as it passes through cords. The greatest danger is in not recognizing the error. Auscultation over stomach during trial ventilations should reveal air gurgling through gastric contents with esophageal placement.

   b. Intubation of the right main-stem bronchus: be sure to listen to chest bilaterally.

   c. Upper airway trauma due to excess force with laryngoscope or to traumatic tube placement.

   d. Vomiting and aspiration during traumatic intubation or intubation of patient with intact gag reflex.

   e. Hypoxia due to prolonged intubation attempt.

   f. Induction of pneumothorax, either from overzealous ventilation or aggravation of underlying pneumothorax.

   g. Teeth or dentures may be broken.

Annex J
Nasotracheal Intubations

Indications
This procedure is indicated for patients who require definitive airway management for Oxygenation, ventilation and/or airway protection, and for whom orotracheal intubation is impossible or contraindicated due to patient presentation or condition. Candidates for this procedure include: conscious, spontaneously breathing patients with an intact gag reflex (such as COPD or asthma); unconscious patients with GCS < 8 due to trauma or medical conditions; patients with possible cervical spine trauma whose injuries may be aggravated by neck flexion & orotracheal intubation; and burn patients.

Limitations
Absolute contraindications for blind nasotracheal intubation are: Apnea, age < 10 years, severe midface congenital or traumatic deformity, and nasal airway obstruction. Relative contraindications include: suspected basilar skull fracture (raccoon eyes, Battle's sign, or CSF leakage from nose or ears), coagulopathy (e.g. hemophilia or liver disease); anticoagulant use (e.g. Coumadin); acute hypertension; or suspected elevated ICP.

Materials

1. Endotracheal tube 0.5 to 1 size smaller than for oral intubation; alternatively, select a tube just slightly smaller than the diameter of the patient's nostril. Avoid using a tube that is too small.

2. Lidocaine jelly:

    a. If time allows, apply this to a nasopharyngeal airway & insert several minutes prior to intubation.

3. BAAM® "whistle-tip" device.

4. 10cc. syringe.

5. Soft suction catheter.

6. EtC02 detection device, preferably capnography with waveform analysis capability.

7. Tape or commercial tube holder device.

Procedure

1. Prepare the tube: wrap it into a circular shape for 1 minute and attach the BAAM® device. Lubricate tip with **LIDOCAINE**.

2. Place the patient into a "sniffing position" ONLY IF CERVICAL SPINE TRAUMA IS NOT SUSPECTED.

3. Insert the tube straight back into the RIGHT nare first, parallel to the floor, anterior to posterior:

    a. Do not angle the tip of the tube upwards towards the skull or downwards.

    b. Insert with the tube bevel towards the patient's nasal septum.

    c. Use a slight back-and-forth rotation of the tube if minor resistance is felt.

4. If significant resistance is encountered, remove the tube & insert into the left nare:

    a. Precautions as above.

5. Once the tip of the tube has reached the pharynx, listen for breath sounds at the proximal end of the tube through the BAAM® device, & observe for tube condensation.

6. IF THE PATIENT IS CONSCIOUS: Ask the patient to take a deep breath, and gently advance the tube during inhalation.

7. IF THE PATIENT IS UNCONSCIOUS: Time advancement of the tube to coincide with inhalation.

8. Indications of proper tube placement:

   a. Patient coughs.

   b. Condensation appears in the tube.

   c. CO2 detection by colorimetric device or waveform analysis occurs.

   d. Conscious patient is unable to speak.

   e. Auscultation of bilateral breath sounds, and chest rise and fall.

9. If tube placement is confirmed, advance another 1 – 1.5 inches to ensure that the tip is in the trachea. Remove the BAAM®.

10. Inflate the cuff & secure the tube: Do not let go of the tube until it has been secured.

Troubleshooting

1. If the tip of the rube reaches the pharynx but will not make the turn through the vocal cords, temporarily remove the BAAM® device & CO2 detector, thread a soft suction catheter through the tube into the patient's pharynx as a guide, advance the ET tube over the suction catheter. Once the ET tube is in place, remove the suction catheter.

2. Ask a conscious patient to stick out his/her tongue while you advance the tube; this minimizes esophageal tube placement.

3. If no BAAM® device is available, pull the bell off a stethoscope & insert the tubing end into the ET tube to auscultate for breath sounds.

Complications
Bleeding (common); nasal fracture; vomiting or aspiration; intracranial tube placement (theoretical).

Annex K
Cricothyrotomy Airway

Criteria

1. Patient with:
    a. Complete upper airway obstruction unrelieved after attempting to open with:
        (1) Abdominal trust.
        (2) Direct laryngoscope with McGill forceps.
    b. Failed airway after RSI that cannot be maintained by OPA or NPA.
    c. Facial trauma with airway compromise that can not be managed with oral or nasal airway adjuncts.

Exclusion Criteria
None

Procedure

1. Select appropriate cricothyrotomy airway to be used.
2. Assemble all necessary equipment.
3. Percutaneous Transtracheal Jet Insufflation.
    a. INDICATIONS:
        (1) Risk of false passage, esophageal perforation, bleeding.
        (2) Patients with total airway obstructions may have difficulty in exhalation that could cause a pneumothorax.
    b. PRECAUTIONS:
        (1) Patients needing emergency airway access that are unable to be ventilated adequately or intubated due to trauma or airway edema.
        (2) This is a temporary last resort measure to Oxygenate the patient.
        (3) This procedure may also be performed quickly prior to a surgical cricothyrotomy to assure landmarks and pre-Oxygenate prior to attempts.
    c. STEPS:
        (1) Universal precautions.
        (2) Have suction equipment ready.
        (3) Place patient supine.
        (4) Maintain spinal motion restriction if indicated.
        (5) Clean the anterior neck with an antiseptic solution.
        (6) Stabilizes the larynx using the thumb and middle finger of one hand.

(7) Palpate the cricothyroid membrane.

(8) Insert a 14g 1-1/4" angiocath attached to a syringe down through the midline of the membrane at a 45 - 60 degree angle inferiorly.

(9) Apply negative pressure to the syringe during insertion until air is aspirated.

(10) Advance the catheter over the needle towards the carina.

(11) Remove the needle and the syringe.

(12) Hold catheter still.

(13) Connect the Jet device (Y adapter and 02 tubing) to the catheter hub.

(14) Turn **OXYGEN** flow to flush or 15lpm.

(15) Occlude the open end of "Y" and ventilates for 1 to 1.5 seconds, observing for evidence of lung expansion.

(16) Release the open end of the Y allowing for exhalation time of at least 4 seconds.

(17) It may be necessary to insert another 14ga. catheter to facilitate better exhalation.

(18) Secure the IV catheter with airtight occlusive dressing.

4. PERTRACH® airway.

a. INDICATIONS:

(1) Inability to secure an airway in the patient with, but not limited to:

- Massive mid-facial trauma.
- Unstable cervical trauma requiring an airway when oral or nasotracheal intubation is not possible.
- Upper airway obstruction, foreign body or hemorrhage.
- Pharyngeal edema due to infection, anaphylaxis, or chemical inhalation.

b. SPECIAL CONSIDERATIONS: PERTRACH® kits are sized for adults and pediatrics, and are designed for a one time use.

c. STEPS:

(1) Select and open adult or pediatric PERTRACH®.

(2) Test cuff on tube and then deflate.

(3) Test dilator for ease of removal.

(4) Apply manual in-line cervical stabilization per Trauma Protocol.

(5) Identify anatomic landmarks.

(6) Cleanse the area with iodine.

(7) Stabilize the position of the larynx manually.

(8) Attach PERTRACH® needle to syringe.

(9) Insert PERTRACH® needle through the cricothyroid membrane, entering the airway at a 90 degree angle.

(10) Draw air to verify needle position, taking care to avoid inserting needle too deeply through the posterior trachea (incorrectly placement of device can cause false passages).

(11) Reposition needle to a 45-degree angle or more angle towards the carina prior to attempting to insert leader of dilator.

(12) Remove syringe, thread filiform portion of dilator into the airway through the needle. Removal of the dilator back through an un-split needle can result in cutting of leader and trachea foreign body. If in doubt, remove both together and start again.

(13) The device is inserted with the thumb on the knob, while second and third fingers are curved under the flange of the tube. Force is applied through the thumb.

(14) Squeeze wings of needle, then open them out to split needle, then (it's helpful if an assistant holds the device in place while the operator uses both hands) split and remove needle.

(15) Exert pressure and force dilator into airway placing tube in a functional position, with face-plate resting against skin.

(16) Remove dilator.

(17) Inflate cuff with 1-8mL of air.

(18) Secure PERTRACH® device and ventilate at appropriate rate.

5. Surgical Cricothyrotomy

NOTE

The decision to perform this procedure must be carefully weighed. If the transport time is short to a hospital, then a Percutaneous Transtracheal Jet Insufflation procedure may be a better choice.

a. INDICATIONS:

(1) Patients needing emergency airway access and control when they are unable to be adequately ventilated or intubated due to trauma or other causes.

(2) This procedure is a last resort airway technique when all attempts at ventilating the patient have failed.

b. PRECAUTIONS: Complications include hemorrhage from great vessel lacerations, damage to surrounding structures.

c. STEPS:

(1) Take Universal Precautions (gloves, goggles, mask).

(2) Have suction equipment ready.

(3) Place patient supine.

(4) Clean the neck with an antiseptic solution.

(5) Stabilize the larynx with the thumb and index finger of one hand.

(6) Palpate the cricothyroid membrane.

(7) Pull the skin taut.

(8) Make a 2cm horizontal incision at the cricothyroid membrane.

(9) Insert the scalpel handle in the incision and rotate it 90 degrees.

(10) Place an endotracheal tube into the incision.

(11) Inflate the cuff and secure the tube.

(12) Ventilate the patient with a BVM and 100% **OXYGEN** observe lung expansion.

(13) Auscultate lung sounds.

(14) Cover the incision site with an occlusive dressing.

Documentation

1. Indication for utilizing this protocol.
2. Interventions attempted prior to performing cricothyrotomy.
3. The effect this intervention had on the patient upon arrival at the Emergency Department.

Annex L
Confirmation of Airway Placement

Criteria
Patient who with endotracheal (ET) tube or Combitube® inserted by FLWEMS personnel.

Exclusion Criteria
None

System Requirement
Every EMS Advance Life Support (ALS) ambulance/engine/apparatus must have a secondary devise for confirmation of ET tube placement that is easily accessible during the procedure of ET intubation or Combitube® insertion. This must include one of the following:

1. Wave-form electronic EtC02 monitor (preferred)

2. Digital electronic EtC02 monitor

3. Colorimetric EtC02 monitor and aspiration esophageal detector device (EDD), i.e. syringe aspiration devise or bulb aspiration devise.

Procedure

1. When EMS paramedic has wave-form EtC02 or digital electronic EtC02 detector:

    a. Insert ET tube or Combitube®.

    b. Attach wave-form EtC02 monitor to BVM.

    c. Ventilate while simultaneously:

        (1) Assuring “positive” C02 wave with each ventilation.

        (2) Verifying absence of gastric sounds.

    d. Verify presence of bilateral breath sounds.

    e. Secure tube.

    f. Continuously monitor wave-form EtC02.

    g. Document all of the above.

2. When EMS paramedic do not wave-form EtC02 or digital electronic EtC02 detector:

    a. Insert ET tube or Combitube®.

    b. Check ET tube with suction/aspiration via EDD.

        (1) Resistance to syringe aspiration or lack of inflation of the self-inflating bulb indicates probable esophageal position of the ET tube.

        (2) During Combitube® placement, switch to ventilation through the proximal (blue or #1) lumen if resistance is noted on aspiration of distal (clear or #2) lumen or if the self-inflating bulb does not fill within a few seconds.

    c. Attach colorimetric EtC02 to BVM.

    d. Ventilate while simultaneously:

(1) Verifying absence of gastric sounds.

(2) Assuring color change to yellow within several ventilations.

e. Verify presence of bilateral breath sounds.

f. Secure ET tubes.

g. Continuously monitor colorimetric EtC02 if present.

h. Document all of the above.

Notes

1. Digital electronic and colorimetric EtC02 detectors may give false negative results when the patient has had prolonged time in cardiac arrest. EDD aspiration devises may give false negative results in patients with lung disease (i.e. COPD or pneumonia) or cardiac arrest.

2. If ET tube is not visualized to pass through a good view of glottic opening, then the chance of misplaced esophageal intubation is increased and transmitted sounds during auscultation alone may lead to misdiagnosed tube position.

3. Immediately remove ET tube or switch to ventilation through other port of Combitube® if any step reveals evidence of lack of lung ventilation.

4. Monitor EtC02 continuously during treatment and transport, but especially after any patient movement or change in resistance to ventilations.

5. Quantitative EtC02 readings may be beneficial in assessing the quality of CPR or as an indicator of the prognosis for successful resuscitation.

6. If Combitube® is used, the EDD should only be applied to the clear (distal or # 2) lumen of the Combitube®.

7. If the patient has a perfusing blood pressure prior to the intubation attempt, skip the EDD and proceed directly to colorimetric EtC02 detector. Auscultation, EDD, and colorimetric ETC02 detectors can all provide false results in certain situations. Therefore, in addition to good breath sounds, confirmation of adequate ventilation by at least one secondary device (EDD or colorimetric EtC02) is enough to confirm tube placement, but the ETT should be removed if neither secondary device confirms ventilation.

Annex M
Thoracentesis

Indications

1. Increased ventilatory pressure resulting in difficulty ventilating the patient (with an open airway).
2. Absent lung sounds on affected side JVD (may not be present with massive blood loss).
3. Hypotension (no radial pulses).
4. Increasing respiratory distress.
5. Decreased Sp02.
6. Traumatic cardiac arrest with chest pathology.

Contraindications
None in the presence of a Tension Pneumothorax.

Complications

1. Laceration of intercostal vessels.
2. Creation of a pneumothorax.
3. Laceration of lung tissue.
4. Risk of infection.

Procedure

1. Identify the second or third intercostal space, midclavicular line on affected side.
2. Quickly prep the area with antiseptic.
3. 14ga Jelco (Needle Decompression).
    a. Insert Jelco into the skin over the 3rd rib just over superior border.
    b. An alternative site is the 5th intercostal space, mid auxiliary line if other sites are unavailable.
    c. Insert the catheter through the parietal pleura until air escapes.
    d. Air should exit under pressure.
    e. Remove the needle and leave the plastic catheter in place.
    f. Reassess frequently for redevelopment of condition.
    g. If tension pneumothorax returns, repeat procedure.
4. Argyle Turkle Safety Thoracentesis Needle
    a. Insert into the skin over the 3rd rib just over the superior border.
    b. An alternative site is the 5th intercostal space, mid auxiliary line if other sites are unavailable.
    c. Insert the catheter through the parietal pleura until air escapes.

d. During insertion the color band will show RED until through the parietal pleura then it goes to GREEN advance Catheter off device.

e. Air should exit under pressure.

f. Reassess frequently for redevelopment of condition

g. If tension pneumothorax returns, repeat procedure.

Annex N
Laryngeal Mask Airway
(LMA)

Description
The Laryngeal Mask Airway is an alternative airway device used for anesthesia and airway support. It consists of an inflatable silicone mask and rubber connecting tube. It is inserted blindly into the pharynx, forming a low-pressure seal around the laryngeal inlet and permitting gentle positive pressure ventilation. All parts are latex-free.

Indications
The Laryngeal Mask Airway is an appropriate airway choice when mask ventilation can be used but endotracheal intubation is not necessary.

Contraindications

- Non-fasted patients.
- Morbidly obese patients.
- Obstructive or abnormal lesions of the oropharynx.

Advantages

- Allows rapid access.
- Does not require laryngoscope.
- Relaxants not needed.
- Provides airway for spontaneous or controlled ventilation.
- Tolerated at lighter anesthetic planes.

Disadvantages

- Does not fully protect against aspiration in the non-fasted patient.
- Standard LMA does not allow high positive pressure ventilation.

Special Features

- May be used as a rescue airway and fiberoptic conduit when intubation is difficult, hazardous or unsuccessful.
- It can be used for bronchoscopy in the awake or asleep patient.

Tips for Success

- Use appropriate size and do NOT over inflate.
- Maintain adequate anesthetic depth.
- Remove when the patient opens mouth to command.

Procedure

1. Head and neck should be stabilized by manual, in-line traction by an assistant grasping patient's mastoid processes to keep neutral head and neck position to simulate airway management of a patient with suspected cervical spine injury.

2. Use size 3 for patients < 155cm tall and size 4 for patients ≥ 155cm.

3. Insert tip against the hard palate behind the upper incisors and sliding the device down the centre of the mouth until resistance was felt or the second bold black line on the tube was positioned between the upper and lower teeth.

4. Inflate cuff with air:

a. Size 3: 20mL

b. Size 4: 30mL

c. Size 5: 40mL

5. Confirm ventilation by connecting the breathing circuit to the device and gently squeezing the reservoir bag and observing the presence of end-tidal carbon dioxide waveforms and chest movement. If it was not possible to ventilate the lungs, we adjusted the position of the LT by gently pushing or pulling it.

6. Adequacy of ventilation was then re-assessed. After confirmation of ventilation, intra-cuff pressure was adjusted 60 to 70 cm H_2O with a cuff inflator.

7. If initial insertion of or ventilation with an airway device fails, up to two reinsertion attempts were permitted. If placement fails after a total of three attempts, stop attempts, ventilate with BVM and consider an alternative adjunct.

8. Upon successful placement of the LMA:

a. Connect BVM with OXYGEN and ventilate at necessary.

b. Confirm placement with:

(1) Lung sounds.

(2) EtC02 Monitor

c. Monitor Sp02.

d. Secure LMA using woven twill tape or commercial device.

Annex O
AutoVent 3000

General
The AutoVent 3000 is a pneumatic device intended for the ventilatory assistance of patients following respiratory/cardiac arrest, near drowning, trauma, paramedical transport and other circumstances requiring ventilatory assistance in the adult and pediatric patient.

Properly used, the AutoVent 3000 is a superior method of ventilation to manual ventilating. Below are methods for utilizing the Auto Vent 3000 with (1) mask and (2) intubation.

Fort Leonard Wood EMS uses quick disconnect fittings for the Auto Vent 3000 and first responder O^2 regulators do not always have compatible fittings.

Advantages: Automatic Transport Ventilator (ATV)

1. Recommended by the American Heart Association over bag-mask ventilation.

2. Gastric insufflation significantly reduced in non-intubated patients due to decrease in ventilation pressures.

3. Consistent minute ventilation maintained throughout movement of patient and transport without interruption.

4. Uniform ventilation and Oxygenation during chest compressions.

5. Synchronization of ventilation to pause in compressions is not necessary with use of ATV (AHA recommendation 1980)

6. Even though this device provides excellent controlled ventilation, the paramedic must continue to monitor the airway and effectiveness of ventilation relative to total patient condition.

7. Pediatric as well as adult settings.

8. Ease of training and application of use.

9. Allows spontaneous breathing upon demand if the patient makes an inspiratory effort (of2 cm H^2O).

Indications

1. Profound hypoxia, which is evidenced by any of the following.

2. Respiratory arrest.

3. Cardiac arrest.

4. Patients able to tolerate endotracheal intubation.

5. Patients in need of ventilatory assistance for pre-Oxygenation prior to intubation (use with appropriate size resuscitation mask and adjunct).

6. Patients with tracheostomy tube in need of ventilatory assistance.

Contraindications

1. Patients not in need of ventilatory assistance.

2. Not for use with patients less that 20kg (44lbs).

General Leonard Wood Army Community Hospital – Emergency Medicine Out-of-Hospital Emergency Medical Services Standard Operating Procedures & Standing Orders for:
AIRWAY CARE, VENTILATORY SUPPORT & DYSPNEA
EMS-SOP 40-1.2-A
(Revised: April 2007)

Procedures

1. Patients in Respiratory Arrest or Profoundly Hypoxic with a pulse.

    a. Perform primary patient assessment and treat per appropriate protocol.

    b. If patient is breathing, administer high flow supplemental OXYGEN via non-rebreather mask. If patient is not breathing or profoundly hypoxic, ventilate with a bag-valve mask and >85% OXYGEN or the AutoVent 3000 with a mask.

    c. Auscultate chest for positive bilateral air exchange sounds and epigastric areas for lack of abdominal air sounds.

    d. Intubate patient by appropriate method.

    e. Auscultate for proper placement of endotracheal tube, use EtCO2 monitor and secure with ET strap.

    f. Connect the Auto Vent patient valve to endotracheal tube using flexible non-rebreathing valve.

    g. Set tidal volume to equal 8 to 10ml for every kg. of body weight (Ex: 70kg = 700ml volume). In the event of a known or suspected past medical history of a pulmonary disease, decrease initial volume setting by 100mL for patients below 175lbs (79kg) lean body weight and by 200mL for patients above 175lbs (79kg) lean body weight.

    h. Set BPM (ventilatory rate) at 8-12bpm.

    i. Observe for chest rise\lung expansion.

    j. If clinical signs of hypoxia persist or SaO^2 remains below 90%, increase first BPM (ventilatory rate) to maximum setting, then if necessary, increase tidal volume in 100ml increments titrated to SaO^2 >90%.

    k. Should patient begin breathing spontaneously (an effort of 2cm H^2O will activate the demand valve) it may be advisable to decrease or turn down the ventilator rate (BPM) to the “0" position. This will allow the patient to breathe spontaneously.

WARNING

Monitor the patient closely while using the demand mode. Should the patient’s respirations slow, become shallow or labored, return to initial automatic ventilator settings immediately.

2. Patients in Respiratory Arrest or Profoundly Hypoxic with a pulse.

    a. Perform primary patient assessment and treat per appropriate protocol.

    b. If patient is breathing, administer high flow supplemental OXYGEN via non-rebreather mask. If patient is not breathing or profoundly hypoxic, ventilate with a bag-valve mask and >85% OXYGEN or the AutoVent 3000 with a mask.

    c. Auscultate chest for positive bilateral air exchange sounds and epigastric areas for lack of abdominal air sounds.

    d. Intubate patient by appropriate method.

    e. Auscultate for proper placement of endotracheal tube, use EtCO2 monitor and secure with ET strap.

    f. Connect the Auto Vent patient valve to endotracheal tube using flexible non-rebreathing valve.

g. Set tidal volume to equal 8 to 10ml for every kg. of body weight (Ex: 70kg = 700ml volume). In the event of a known or suspected past medical history of a pulmonary disease, decrease initial volume setting by 100mL for patients below 175lbs (79kg) lean body weight and by 200mL for patients above 175lbs (79kg) lean body weight.

h. Set BPM (ventilatory rate) at 8-12bpm.

i. Observe for chest rise and lung expansion.

j. If clinical signs of hypoxia persist or SpO^2 remains below 90%, increase first BPM (ventilatory rate) to maximum setting, then if necessary, increase tidal volume in 100ml increments titrated to SpO^2 >90%.

k. Should patient begin breathing spontaneously (an effort of 2cm H^2O will activate the demand valve) it may be advisable to decrease or turn down the ventilator rate (BPM) to the "0" position. This will allow the patient to breathe spontaneously.

WARNING

Monitor the patient closely while using the demand mode. Should the patient's respirations slow, become shallow or labored, return to initial automatic ventilator settings immediately.

l. Check ET tube for correct placement, blockage, kinks and pilot balloon inflation.

m. Check patient valve for foreign material or obstruction.

n. Check green breath indicator on delivery valve for positive function.

o. Check hose assembly to Control Box.

p. Check Tidal Volume and BPM control settings.

q. Check OXYGEN supply line attachment.

r. Check OXYGEN supply source and regulator.

s. If unable to promptly (30sec) resolve suspected difficulty, disconnect AutoVent 3000 and ventilate via bag-valve tube with high-flow 100% **OXYGEN**. Recheck by auscultation for positive bilateral air lack of and negative abdominal air exchange.

Annex P
AMBU RDIC Bag-Valve-Mask
(with Butyl Cover)

General
The Ambu, RDIC is a modification of the Ambu Mark (Mil) Resuscitator. Directions for use of this device are included in the Ambu RDIC carrying case, and are amended by this supplemental sheet specific to the Ambu RDIC.

Use of the Ambu RDIC should be in full accordance with current military regulations. Never attempt to use the Ambu RDIC in a possible toxic environment without a filter attached to the inlet to the resuscitator. Follow all other precautions as stated in Directions for Use of the Ambu Mark III (Mil) Resuscitator.

Materials
RDIC components not listed in standard directions

- Extension tube
- Extension tube connectors Head harness
- Face shield
- Butyl rubber Polyacetal
- Natural conductive rubber Polyethylene

Supplementary Specifications
The Ambu RDIC, as provided, is designed and manufactured to fully meet or exceed all specifications called for by the current US army TDP. The performance specifications as stated in the Directions for the use of the Ambu Mark III (Mil) Resuscitator are applicable to the Ambu RDIC.

Supplemental Operating Instructions
The RDIC is designed for use in strict accordance with military regulations. If use of cricothyroid cannula is indicated and authorized, follow closely with military guidelines and manufacturers directions for use. When supplemental OXYGEN is to be given through filter adaptor, the protective black cap must be removed from the inlet nipple before OXYGEN supply tube may be attached.

Chemical Decontaminations Procedures
Although the M270, Decontamination Kit, Individual, Equipment (DKIE) is effective for the removal of gross amounts of liquid *contaminants* from the exterior of the RDIC following a chemical agent attack, the STB slurry (prepared IAW FM 3-5) is most effective for overall chemical decontamination. The STB slurry allows greater cleaning into the recessed areas of the RDIC which are not easily accessed using the DKIE wipes. An added benefit of using the STB slurry for chemical decontamination is that the RDIC will also be fully disinfected after such cleaning. DS-2 should be avoided as it has a degrading effect on the silicone components of the RDIC. These include the valve membranes in the inlet assembly and patient valve of the RDIC.

Introduction
The Ambu® Mark III resuscitator, with butyl outer cover, is designed for ventilation of adults and children with a body weight of more than approx. 15 kg (3 years). It is based on the original Ambu double-wall design principle.
During single-hand operation of the bag the elasticity of the outer cover will prevent the airway pressure from rising above 70 mbar (cmH_2O). This pressure limitation effect without loss of stroke volume is a unique feature of the Ambu Mark III resuscitator. The resuscitator has a 30 mm ISO expiratory connector for direct attachment of the Ambu® PEEP valve. A gas filter may be attached to the inlet of the bag.

Warnings and Caution Statements

WARNING

- Insufficient, reduced, or no airflow may result in brain damage to the patient being ventilated.
- For use by CPR-trained personnel only. A tight seal between face and mask is essential. Failure to achieve a tight seal may result in reduced or no ventilation.

- Watch the movement of the chest and listen for the expiratory airflow from the valve to check the efficiency of the ventilation. Failure to do so may result in insufficient ventilation.
- IMMEDIATELY switch to mouth-to mouth ventilation if efficient ventilation cannot be obtained with this device. Failure to do so may result in insufficient ventilation.
- Do not smoke or use near open flames when using OXYGEN. Fire may result.
- Do not use the resuscitator in a toxic or hazardous atmosphere unless a gas filter is connected to the inlet valve of the bag. Injury may result. See Section 5.4 for details.

CAUTION

- U.S. federal law restricts this device to sale by or on the order of a physician.
- Before operating the resuscitator, a complete test for correct operation must be per-formed. See Section 9 for details.
- Following unpacking and any disassembly of the resuscitator, inspect all parts for any defects before reassembly and then perform a complete test for correct operation before use or storage of the resuscitator.
- If the resuscitator with attachments is placed on standby for emergency use, such kit should be inspected at regular intervals to assure integrity.
- Avoid contact with oil and grease. Such products may affect the integrity of the resuscitator materials. In case of exposure, clean thoroughly.
- Oil or grease should not be used in close proximity to OXYGEN equipment - fire may result.

Specifications
The Ambu Mark III resuscitator is in conformity with the following standards: prEN 794-4:1996 ISO 8382:1988 ASTM F 920-93. The Ambu Mark III resuscitator is in conformity with Council Directive 93/42/EEC concerning Medical Devices.

Adults, and children with a body weight of more than approx. 15 kg (3 years)

Operating temperature range:	4°F - 122°F (-20°C to 50°C)
Storage temperature range:	40°F - 158°F (-40°C to 70°C)
Max. stroke volume:	Approx. 1300 ml
Maximum frequency of Ventilation:	Depends on the inspiratory volume used. The rate of expansion of the bag is more than adequate for all frequencies recommended for practical use.
Volume of OXYGEN reservoir bag:	Approx. 1500 ml
Resuscitator dead space:	11 ml
Backward and forward leak:	Not measurable
Expiratory resistance at 50 1/min:	'Approx. 0.20 kPa (2.0 cmH_2O)
Inspiratory resistance of the	Approx. -0.41 kPa (-4.1 cm H_2O) resuscitator at 50 1/min:
Inspiratory resistance of OXYGEN	Approx. -0.16kPa (-1.6 cm H_2O) reservoir bag at 50 1/min without inlet of OXYGEN:
Pressure limiting system:	The elasticity of the outer cover will limit airway pressure to max. approx. 7 kPa (70 cm H_2O) during one hand compression

Length of resuscitator: Diameter of bag:	300 mm 125 mm
Patient connector: Expiratory connector:	22 / 15 mm (ISO)
Bag inlet connecter:	30 mm male (ISO) (ISO 8382) 32 mm female taper for attachment of Ambu OXYGEN reservoir bag or gas filter adaptor EN 148

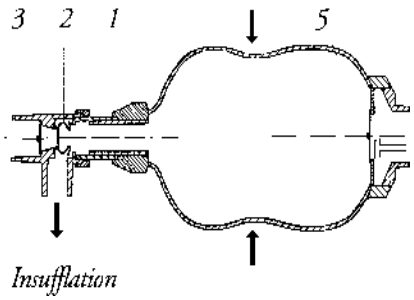
Weight of resuscitator with patient valve but without reservoir and mask: Approx. 345g

Materials
(*) Optional

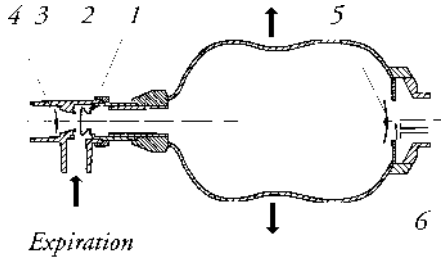
Parts	Materials
Inner bag	EPDM rubber
Outer cover of bag	butyl rubber
Valves, transparent plastic parts	polysulphone
Valves, non transparent plastic parts	polyacetal
Valve bellows and membranes	silicone rubber
Gas filter adapter	polyacetal
OXYGEN reservoir bag (*)	coated nylon material
Connecter for reservoir	polyacetal
Hanging strap	EPDM rubber
OXYGEN supply tubing (*)	EPDM rubber
Tube adapter (*)	polyacetal
Extension tube (*)	EPDM rubber

Principles of operation

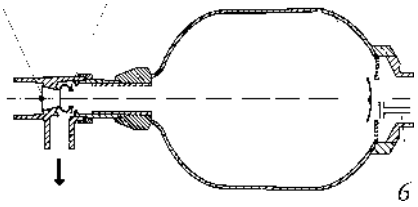
Insufflations
When the bag is compressed, the air flow forces the membrane (1) of the patient valve to open. The mushroom bellows *(2)* is forced towards the seat (3), closing the passage to the expiratory port. The air now flows via the patient connector to the lungs of the patient. The positive pressure created in the bag keeps the bag inlet valve *(5)* closed.



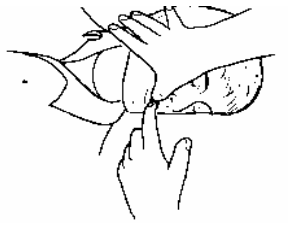
Expiration
The valve membrane (1) is already closed when insufflations ceases and prevents back flow into the bag. The mushroom bellows *(2)* moves away from the seat (3) and allows the expired air to pass out through the expiratory port via the expiratory membrane (4). The negative pressure created in the bag during expansion opens the bag inlet valve *(5)* and allows fresh air to be drawn in. The ventilation air can be enriched with OXYGEN, which is supplied via the tube nipple (6), the reservoir bag attachment or the gas filter adapter.



Spontaneous Breathing
During the patient's inspiration, fresh air or OXYGEN-enriched air is drawn in via the bag inlet valve *(5)* and *OXYGEN* nipple (6) through the patient valve via the membrane (1) to the patient. During spontaneous inspiration the expiratory membrane *(4)* is closed so that all inspiratory gas passes through the bag. Expiration follows as described above.

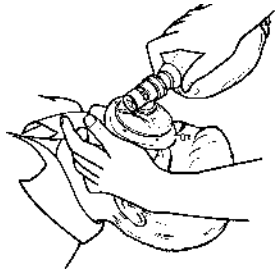


Operating Instructions
Ventilation with a face mask



Clear mouth and airway of foreign bodies, if any visible.

Use accepted techniques to position the patient correctly to open the airway.



Grasp the bag and apply the mask firmly to the patient's face to achieve a tight seal. Hold the mask tight against the face while maintaining the correct head tilt to keep the airway open.

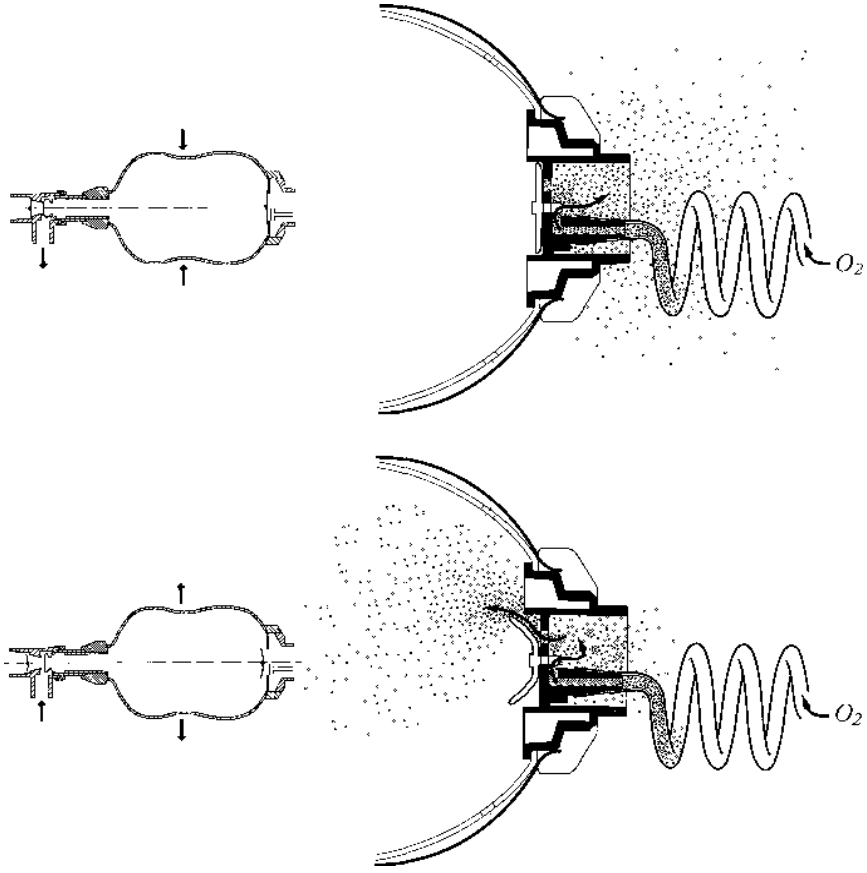
WARNING

Proper training on the correct application of the face mask is crucial before attempted use of any resuscitator. Failure to do so may result in no or reduced airflow.

Squeeze the bag with one hand at the rate of about 12-15 times per minute for adults and about 10-20 times for children.

During insufflation observe the rise of the patient's chest. Release the bag abruptly, listen for the expiratory flow from the patient valve and observe lowering of the chest. If continued resistance to insufflation is encountered, check for airway obstruction or correct the backward head tilt. If the patient vomits during mask ventilation, clear the patient's airway of vomitus. Before resuming ventilation, compress the bag freely a few times. Usually it is not necessary to disassemble the valve immediately for cleaning. Administer OXYGEN according to medical indications.

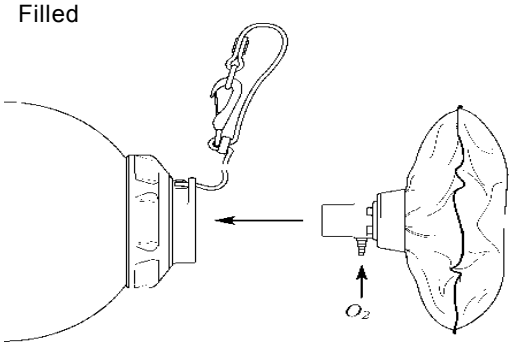
OXYGEN Administration without Reservoir
Supplementary OXYGEN can be administered by connecting the **OXYGEN** nipple on the inlet valve to an OXYGEN flow meter.



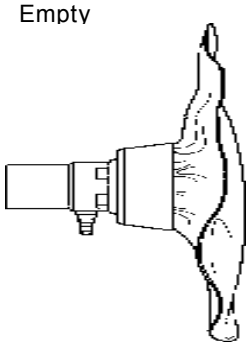
OXYGEN Flow	Ventilation volume (ml) x frequency (cycles per minute) OXYGEN concentration without reservoir in %							
liter/min.	250x12	250x24	600x12	600x24	750x12	750x24	1000x12	1000 x24
2	34	34	28	27	27	26	26	26
5	44	43	34	33	32	32	31	31
10	60	60	44	43	39	39	39	38
15	82	82	54	53	52	51	46	45

OXYGEN Administration with Reservoir Bag Attachment (optional)
By connecting the OXYGEN reservoir bag attachment, optimal OXYGEN economy is obtained, and the ventilation gas will be 100% OXYGEN when the OXYGEN flow is equal to or greater than the minute ventilation.

Filled



Empty



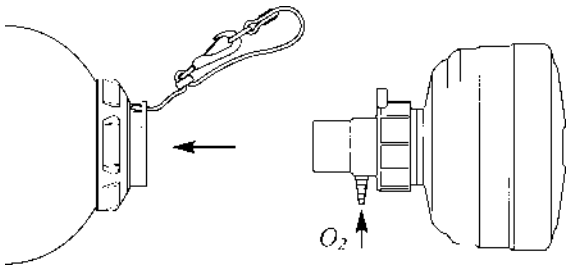
OXYGEN Flow	Ventilation volume (ml) x frequency (cycles per minute) OXYGEN concentration with reservoir in %							
liter/min.	250x12	250x24	600x12	600x24	750x12	750x24	1000x12	1000x24
2	74	47	43	32	38	30	34	28
5	100	87	76	48	65	43	57	37
10	100	100	100	76	100	65	87	54
15	100	100	100	100	100	87	100	70

These values correspond to the theoretically possible, i.e. higher OXYGEN concentrations cannot be reached.

For quick reference a simplified chart is printed on the reservoir bag. The indicated OXYGEN concentrations will be obtained and exceeded as long as the minute ventilation is equal to or less than 1000 X 15 = 15 l/min. and 300 X 20 = 6 1/min., respectively.

Examples
Introduce an OXYGEN flow at 13 1/min. into the inlet of the reservoir bag attachment. With a ventilation volume of max. 1000 ml and a compression frequency of max. 15 per minute, an adult will receive an OXYGEN concentration of no less than 85%. Introduce an OXYGEN flow at 2 1/min. into the inlet of the reservoir bag attachment. With a ventilation volume of max. 300 ml and a compression frequency of max. 20 per minute, a child will receive an OXYGEN concentration of no less than 40%.

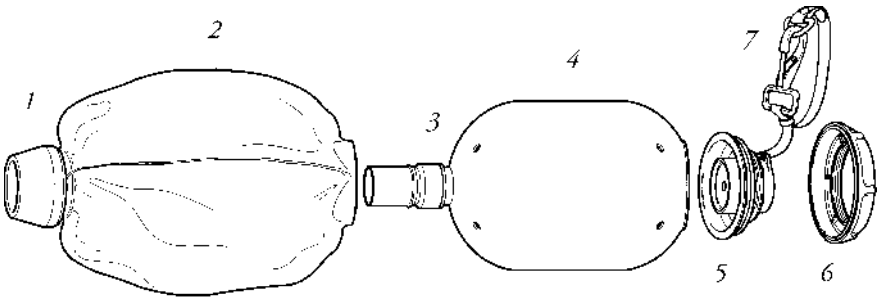
OXYGEN Administration with Gas Filter Adapter and Protective Mask Filter
With a gas filter attached to the resuscitator, the OXYGEN concentrations indicated below can be obtained.



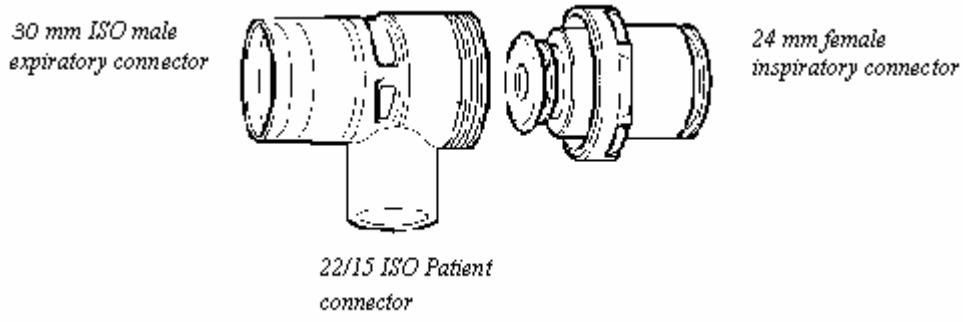
OXYGEN flow	Ventilation volume (ml) x frequency (cycles per minute) OXYGEN concentration with gas filter attachment in %							
liter/min.	250x12	250x24	600x12	600x24	750x12	750x24	1000x12	1000x24
2	74	47	43	32	38	30	34	28
5	100	87	76	48	65	43	57	37
10	100	100	100	76	100	65	87	54
15	100	100	100	100	100	87	100	70

Description
The basic Ambu Mark III resuscitator consists of the following parts: Bag with inlet valve and patient valve. Masks, OXYGEN reservoir bag attachment, gas filter adapter and PEEP valve are accessories, which make the Mark III resuscitator a most versatile resuscitation unit.

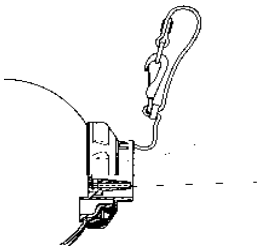
Bag
The bag consists of a self-expanding inner bag (4) made from EPDM molded rubber. The thin-walled butyl outer cover (2) has a large opening at one end to facilitate insertion and removal of the inner lining. The rigid-neck section (1) at the opposite end of the outer cover makes an airtight fit with the outlet connector (3) of the bag and the flanged inlet valve housing (- 61 - & 6) seals the large opening. A hanging strap (7) is attached to the inlet valve housing allowing the unit to be conveniently hung.



Patient Valve



Inlet Valve

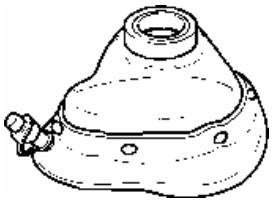


Hanging Strap

ISO 32mm female connector for attaching OXYGEN reservoir or gas filter adapter.

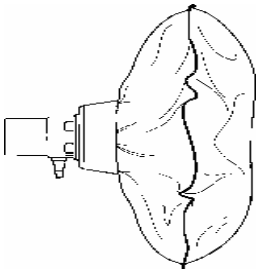
OXYGEN inlet nipple for use when OXYGEN reservoir or gas filter is not connected.

Masks (optional accessory)



For further information please refer to the directions for use of the Ambu face masks.

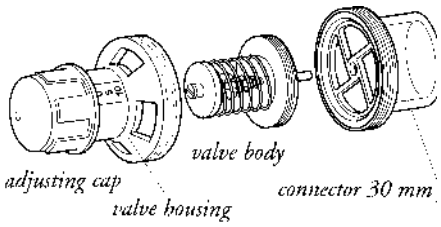
OXYGEN reservoir Bag Attachment (optional)



The OXYGEN reservoir bag assembly consists of a light weight air tight nylon bag attached to a valve connector, which fits into the inlet valve housing of the resuscitator.

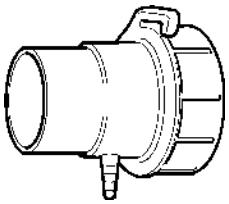
The valve connector contains two silicone rubber membranes, which allow ambient air to be drawn in when the bag is empty and surplus OXYGEN to spill out when the bag is full.

PEEP Valve (optional accessory)



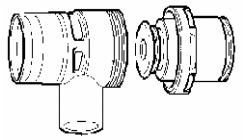
For further information please refer to the directions for use of the PEEP valve.

Gas Filter Adapter



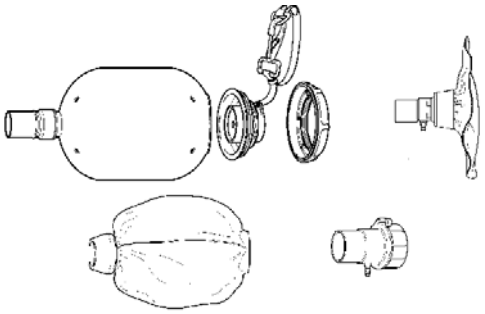
The OXYGEN inlet of the gas filter adapter is equipped with a valve that prevents unfiltered air from entering the bag during ventilation when an OXYGEN supply is not connected.

Cleaning – Disinfecting – Sterilizing



Parts exposed to expiratory gases: After each patient.

Parts not exposed to patient expiratory gases:
Regularly as needed to remove dust etc.



The complete resuscitator after use for patient/environments with infectious diseases. The figure shows the resuscitator disassembled for cleaning, disinfecting and sterilizing.

NOTE: Do not disassemble parts further than shown.

■ : Applicable O : Not Applicable	Methods							
	Cleaning		Disinfecting – Sterilizing					
	Washing		Disinfecting			Auto Claving		
Resuscitator Parts	Manual Washing	Washing Machine (W.M.)	W.M. Heat Disinfecting	Boiling	Chemical	121° C (244°F)	134°C (273°F)	
Patient Valve	■	■	■	■	■	■	■	
Bag	■	■	■	■	■	■	■	
Gas Filter Adapter	■	■	■	■	■	■	■	
Extension Tubing	■	■	■	■	■	■	■	
OXYGEN Supply Tube	■	■	■	■	■	■	■	
OXYGEN Reservoir Attachment	■	O	O	O	■	O	O	

*** The table shows applicable methods of cleaning, disinfecting and sterilizing.

Detergents and Chemical Disinfectants
Numerous brands of detergents and chemical disinfectants are available. Use only brands that are compatible with the resuscitator materials to avoid reduction in the life-time of the materials. See list of materials. Follow the instructions of the manufacturer of the detergent or chemical disinfectant for dilution and exposure time. Substances containing phenol should be avoided.

CAUTION

- Avoid using substances containing phenol to clean the resuscitator. Phenol will cause premature wear and degradation of the materials or reduced product lifespan.
- Promptly remove all residue of cleaning materials from the resuscitator. Residues may cause premature wear or reduced product lifespan.

Information on selected detergents and chemical disinfectants verified for compatibility with the resuscitator materials is available on request from the local Ambu representative or Ambu International A/S.

The cleaning, Disinfection and Sterilizing Process.
The following steps are generally recommended. Select proper methods for the resuscitator parts in question according to the table above:

1. Disassembly of the resuscitator and accessories.
2. Cleaning of parts.
3. Disinfecting and/or sterilizing.
4. Drying and cooling.
5. Inspection of parts.
6. Reassembly and testing.

Disassembly of the Resuscitator
The disassembled resuscitator is shown on the exploded view above.

Cleaning of Parts: Manual washing or automatic washing machine
Wash the parts in warm water using a detergent suitable for the resuscitator materials cf. paragraph 3. Rinse all parts thoroughly in clean water to remove all detergent residues.
If surface cleaning and/or disinfecting of the outer surfaces of the resuscitator are carried out, make sure that the detergent and/or disinfectant is compatible with the materials of the resuscitator and be sure to remove the detergent/disinfectant by rinsing with water. If residues are allowed to dry on the resuscitator, the life-time of the materials may be reduced. An automatic washing machine with a programmed designed for washing anesthesia breathing equipment may be used.

Disinfecting and/or sterilizing
Select heated or chemical disinfection according to local standards for disinfection and the table of applicable methods.

Washing machine - Heat disinfecting program
Automatic washing machines designed for medical equipment will normally include program cycles for heat disinfection.

Boiling
Use clean water, heat and boil parts for e.g. 10 minutes to disinfect.

Chemical Disinfecting
Follow the instructions of the manufacturer of the chemical disinfectant for dilution and exposure time. After exposure of the resuscitator parts to the chemical disinfectant, rinse thoroughly in clean water to remove all residues.

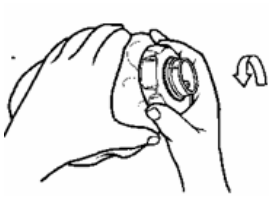
Autoclaving
Use standard autoclaving equipment adjusted for 121°C (244 °F)or 134°C (273 °F) respectively for resuscitator parts according to the table above.

Drying and Cooling
Leave the parts to dry and/or cool completely before reassembling the resuscitator.

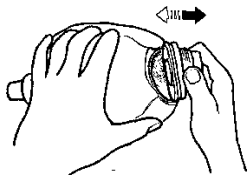
Inspection of Parts
After cleaning, disinfecting and/or sterilizing carefully inspect all parts for damage or excessive wear and replace if necessary. Some methods may cause discoloration of rubber parts without impact on their life-time. In case of materials deterioration e.g. cracking, the parts should be replaced.

Assembling and Testing
Reassemble the resuscitator and the accessories according to instructions in of this manual. Carry out the test for correct operation IAW of this manual.

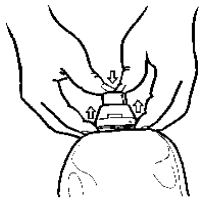
Disassembly and Assembly



1. Unscrew the large flange

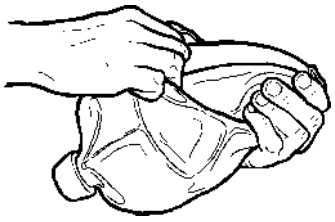


2. Remove the inlet valve

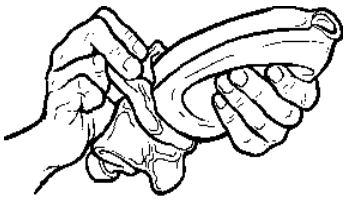


3. Press the outlet connector of the inner bag (click function).

4. Fold the inner bag lengthwise inside the outer cover.



5. Hold the folded inner bag and the outer cover and start pulling off the outer cover.

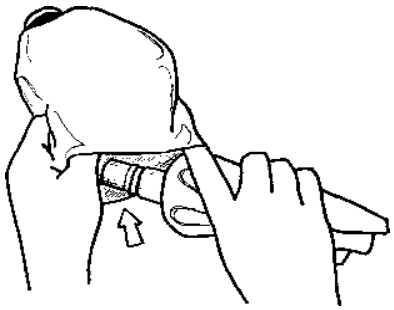


6. Pull off the outer cover.

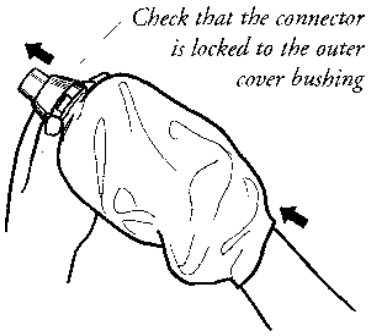
NOTE

Further disassembly should not be carried out.

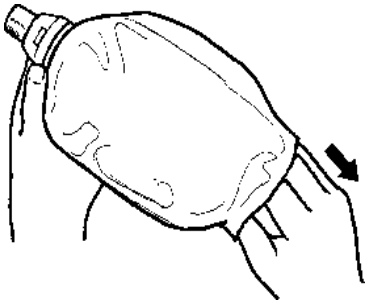
Assembly of Bag



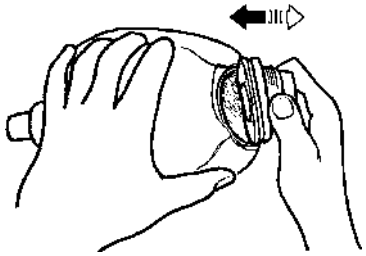
1. Insert the folded inner bag with one hand.



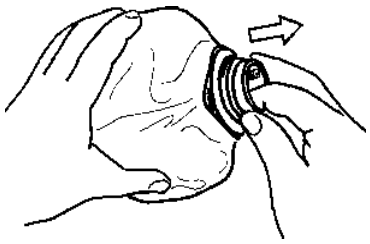
2. Push the outlet connector through the rigid neck section of the outer cover until it snaps into position (click function)



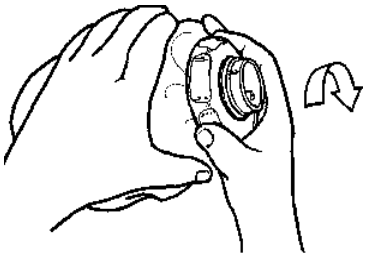
3. Release the inner bag and retract the hand.



4. Push the flange of the inlet valve housing through the large opening.

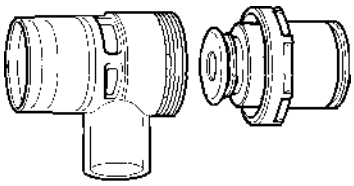


5. Pull the housing back towards the opening of the inner lining, until the edge snaps into the groove of the flange.



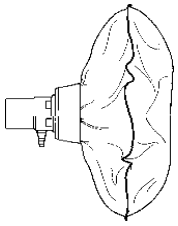
6. Screw the large nut on to the inlet valve housing and tighten against inner bag and outer cover.

Disassembly of Patient Valve



Loosen the serrated nut and remove the inlet connector with bellows assembly from valve. Further disassembly should not be carried out.

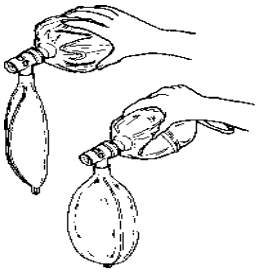
OXYGEN Reservoir Attachment (optional)



Do not disassemble for cleaning

Test for Correct Operation

Pre-operation test. If the resuscitator fails any test, disassemble and reassemble it. Perform the test again. DO NOT USE the resuscitator unless it satisfactorily performs ALL applicable tests.



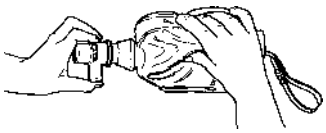
Resuscitator

Connect a 1.5 – 2L breathing bag to the patient connector. Squeeze and release the resuscitator several times and check that the test bag fills. During continued ventilation, expansion and relaxation of the test bag must be visible.

Squeeze the resuscitator and hold. In this way a positive pressure should be created which remains in the test bag until the resuscitator is released.

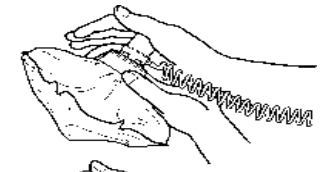
WARNING

Perform this test immediate prior to each use of the resuscitator. Failure to do so may result in no or reduced ventilation.

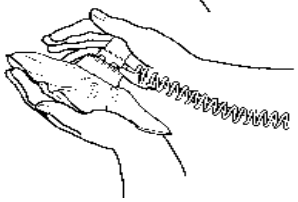


Close the patient connector with one finger and compress the bag firmly to check tightness and proper valve fitting.

OXYGEN Reservoir Bag Attachment

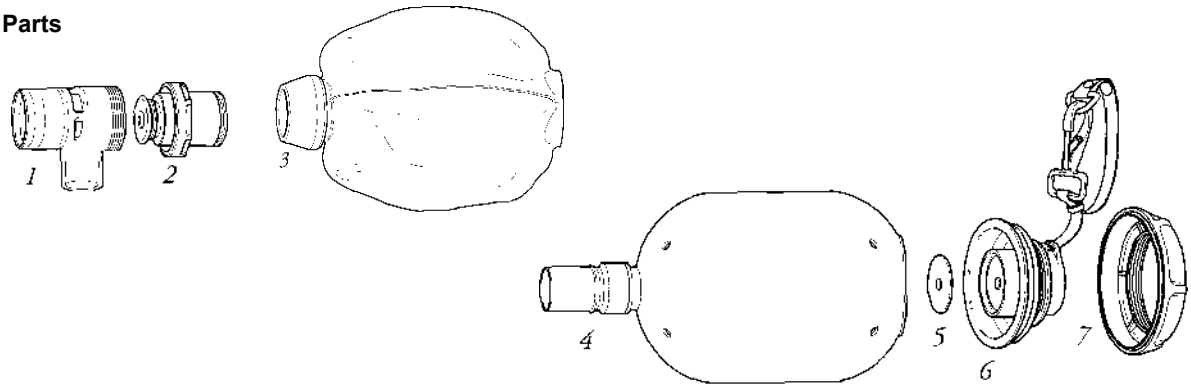


Supply a gas flow of 3 1/min. to the inlet nipple. Close the outlet with one hand. The bag should now fill in approx. 20 seconds.



Squeeze the bag and check that the gas is easily vented into the ambient air via the spill valve slots.

Spare Parts



	Cat. No.	
1	208 000 502	Patient valve housing with outlet valve
2	208 000 501	Patient inlet valve, complete
3	233 000 502	Butyl outer cover
4	209 000 504	Inner bag with outlet connector
5	000 209 010	Inlet valve disc
6	215 000 505	Inlet valve housing with membrane and
7	209 000 503	Flange nut
8	000 211 000	Gas filter adaptor (filter thread EN 148)
1-2	000 208 000	Patient valve, complete
3-7	000 233 000	Bag, complete

Service
The Ambu resuscitator is designed for long, trouble-free use and requires no regular maintenance.

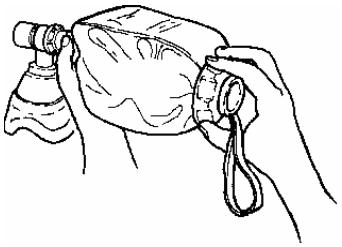
Careful inspection of all parts is recommended after disassembly for cleaning, disinfecting or sterilizing.

If parts are lost or become defective, spare parts are available (see list paragraph 10).
A repaired resuscitator must be checked for proper operation according to this manual before being released for use again.

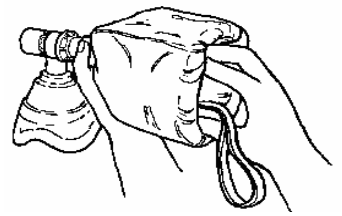
CAUTION

Be sure to perform the test for correct operations prior to use.

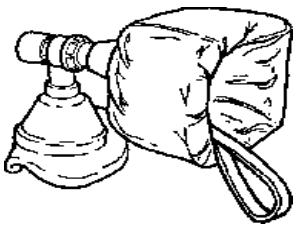
Storage



For compact storage i.e. in an emergency case the inlet end can be pushed half-way into the bag.

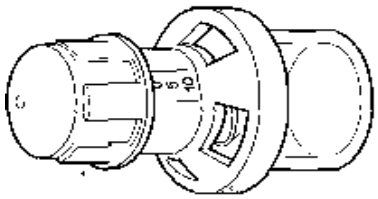


When the resuscitator is ready for use it should not be kept in direct sunlight or in a heated atmosphere.

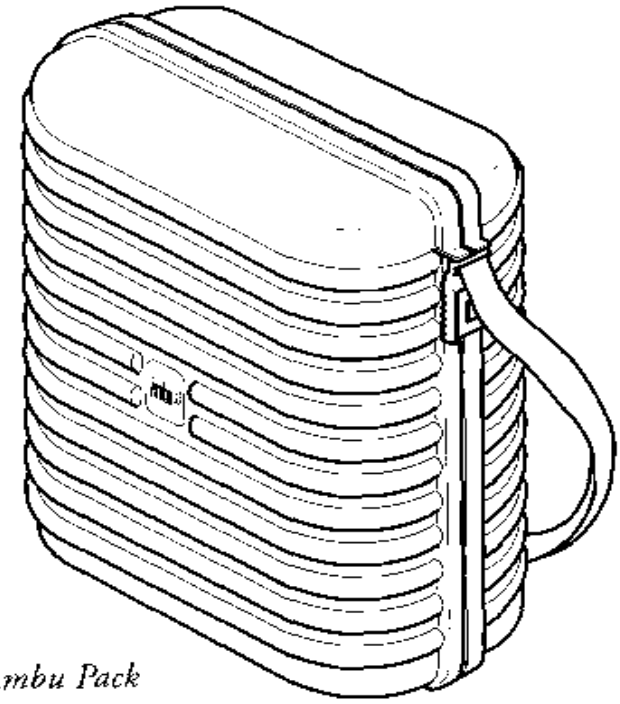


For long-term storage the resuscitator should be kept in a closed packing in a cool place away from direct sunlight.

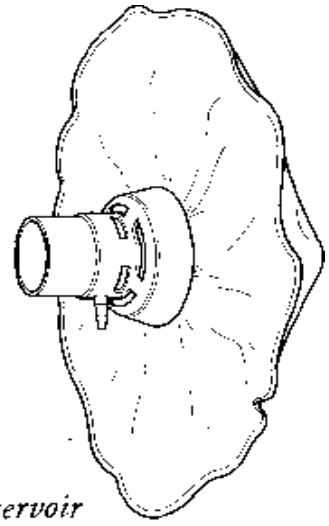
Accessories



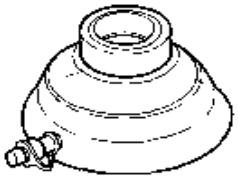
PEEP valve



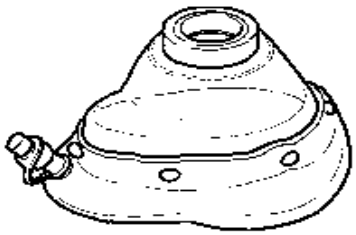
Ambu Pack
L x H x D
350 x 280 x 140 mm
Weight empty: 0,705 kg.



O_2 reservoir



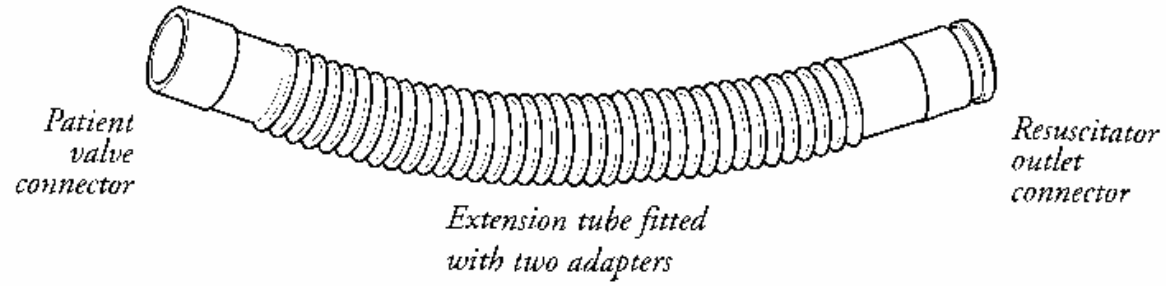
Face mask, size 0



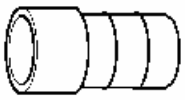
Face mask, size 2, 4 & 5

Catalog Number

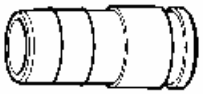
230 000 001	Ambu Pack with transparent cover, empty
230 000 051	Ambu Pack with orange cover, empty
000 137 000	PEEP 10 valve
000 213 000	PEEP 20 valve
000 210 000	OXYGEN reservoir bag attachment
000 014 000	Face mask, size 0 with boring
000 016 000	Face mask, size 2
000 012 000	Face mask, size 4
000 017 000	Face mask, size 5



Extension tube fitted with two adapters



Tube adapter 28/32 mm



Tube adapter 24 mm

Oxygen supply tube

Catalog Number

209	000	701	Extension tube, length 30 cm, with 2 adapters.
209	000	702	Extension tube, length 90 cm, with 2 adapters.
209	000	703	Extension tube, length 105 cm, with 2 adapters.
000	059	274	Tube adapter 28/32 mm, 28 mm female connector for fitting on inlet connector of the Mark III patient valve, 32 mm male connector for fitting on inlet valve of the Mark III bag
000	059	276	Tube adapter24 mm female for fitting on outlet connector of the Mark III bag
000	171	004	OXYGEN supply tube

Annex Q
Bag-Valve-Mask
(BVM)

Procedure

1. Take Body Substance Isolation precautions.

2. Open the airway, insert an airway adjunct, and select the appropriate size mask.
While positioned at the top of the patient's head, open the airway using the head-tilt/chin-lift maneuver or the jaw-thrust maneuver. Insert the appropriate sized airway adjunct. Choose the appropriate size mask for the patient. The mask should be transparent with an air cushion that rests against the patient's face.

3. Hold the mask position. Place the mask over the patient's face assuring the top of the mask is over the bridge of the nose and the bottom is in the groove between the lower lip and the chin. Using the "OK" hand position, with both hands, manually open the airway and maintain the mask seal.

4. Connect the bag to the mask If you haven't already done so, attach the bag-valve unit to the mask.

5. Ventilate the patient. Squeeze the entire bag over 1-2 seconds and then release the bag. Each ventilation must be a minimum of 800cc. Assure appropriate chest rise during ventilations. Continue to ventilate the patient for 30 seconds prior to attaching the OXYGEN.

6. Attach the OXYGEN. Assemble the OXYGEN tank and regulator if not already completed. Attach OXYGEN tubing to the regulator and to the BVM's reservoir. Turn on the OXYGEN and adjust the regulator to 15 liters per minute. Allow the reservoir to fill with OXYGEN prior to the first ventilation.

7. Reposition patient and begin artificial ventilations. As completed earlier, open the airway, place mask over the patient's face, continue with proper mask/face seal, and begin ventilations.

Two-Person Ventilations
Each ventilation must be a minimum of 800cc. This procedure must be practiced with a second rescuer. Switch off who controls the airway and mask with the student who ventilates. One student will maintain a mask seal using both hands while maintaining an open airway. The other student will ventilate the patient by collapsing the bag on the BVM fully with both hands.

VENTILATION OF A PATIENT WITH SUSPECTED SPINAL INJURY

This procedure should be used on any patient requiring ventilation with evidence of blunt trauma from the clavicles to the head. If only one rescuer is available for ventilation, the pocket mask must be used. If two rescuers are available for ventilation, a BVM should be used. It is mandatory that two hands be used on the mask and that the jaw-thrust is used.

Annex R
Demand Valve Mask (DVM)
(Positive Pressure Ventilation)

General
The demand valve resuscitator is intended to assist with ventilation, delivering a variation of tidal volumes. The demand valve resuscitator will connect to both the Combitube and ET tubes as well as standard pocket masks or blob masks.

Indication

1. Patients weighing at least 40 kg requiring controlled ventilatory assistance due to ↓ LOC or apnea.

Contraindications

1. Patients weighing < 90 lbs or < 12 years of age.

2. Patients with a known tidal volume that is below normal, i.e. patient with one lung removed.

Precautions

1. Do not make changes in the configuration of the tubes, hoses, or parts without manufacturer and medical direction approval.

2. Source gas must be medical OXYGEN limited to 50psi.

3. The device must be tested prior to use on any patient.

4. Frequent re-evaluation of ventilation is critical. There is no audible alarm to indicate the resuscitator is not working. If there is any question about whether the patient is being adequately ventilated, discontinue use and manage the airway with a bag valve mask and 100% **OXYGEN**.

5. Patients with increased airway resistance, from causes such as asthma, near drowning, and pulmonary edema, may require higher inspiratory ventilation pressures. In these instances, pre-set tidal volumes may not be delivered to the patient. Discontinue resuscitator use and proceed with bag valve mask ventilation (no demand valve) to ensure adequate tidal volumes.

6. Device will stop functioning if OXYGEN tank is empty.

7. In the spontaneously breathing patient, discontinue resuscitator and support breathing manually as needed.

Procedure

1. Insure patient's ABCs are being appropriately managed. If standard resuscitation mask is being used, attempt to insert oral or nasal airway.

2. Insert advanced airway (Combitube or ET tube) per appropriate procedures.

3. Patient ventilation.

    a. Attach device to tube on the advanced airway.

    b. Press resuscitator button and assess for adequate ventilation, i.e. chest rise, lung sounds, SpO2.

    c. If adequate chest movement does not occur, an increase in airway pressure is occurring.

        (1) Check for kinked tubing. Correct as indicated.

        (2) Assess patient for airway obstruction. Suction and treat as indicated.

(3) If airway is not obstructed, and inadequate chest movement occurs, discontinue use and proceed with bag valve mask ventilation (no demand valve) to ensure adequate tidal volumes.

4. Disinfection must be accomplished according to manufacturer specifications after every patient use.

Annex S
Direct Laryngoscopy

General
Direct laryngoscopy is done with the patient lying on his or her back; the laryngoscope is inserted into the mouth to push away the tongue and lift the epiglottis so that a view of the glottis is possible. This procedure is most often employed in tracheal intubation. It is painful and extremely uncomfortable and is usually not done in conscious patients. One of the main complications when using a laryngoscope is dental damage to the patients upper teeth.

Indications

- Inability to Oxygenate patient (SpO_2 < 90%, PaO_2 < 55)
- Inability to ventilate patient (rising $PaCO_2$, respiratory acidosis, mental status change or other symptoms)
- Patient unable to protect the airway

Contraindications

- Neck immobility or increased risk of neck trauma (e.g. rheumatoid arthritis, cervical spine injury, etc.)-consider fiberoptic intubation.
- Inability to open mouth (e.g. trismus, scleroderma, surgical wiring, etc.)-consider nasal intubation, either blind or fiberoptic, or surgical airway.

Preparation and Anesthesia
(See rapid sequence timeline)

1. Assemble equipment.
2. Calculate doses and draw medications into syringes.
3. Check IV access and flush fluid.
4. Do you predict a difficult airway?
5. Is the patient unresponsive or near death?
6. Position patient.
    a. Bed at comfortable height for laryngoscopist.
    b. Patient aligned without lateral deviation of head or neck.
    c. Shoulders and/or neck supported with rolls or pillows to allow positioning of head.
    d. Neck flexed approx. 15 degrees on chest.
    e. Head hyperextended on neck to maximum comfortable degree (may be best done after induction).
7. Preoxygenate patient 5 minutes on 100% OXYGEN via mask (straps or person holding in place).
8. Consider premeditations, optional for most patients-usually given 2-3 minutes prior to induction
    a. Defasciculating drug (for patients who will get SUCCINYLCHOLINE, but may not tolerate fasciculation, e.g. elevated intracranial or intraocular pressure)
    b. Prevention of vagal response (especially children younger than age 5 often have bradycardic response to laryngoscopy)
    c. Prevention of worsening intracranial pressure or bronchospasm.

d. Prevention of hypertensive response in patients with elevated intracranial pressure, heart disease or aneurysm.

9. Administer a precalculated dose of an induction agent:

	Dose	Advantages	Cautions
ETOMIDATE	0.3 mg/kg	Good for low blood pressure; okay in hypovolemia	Nausea and vomiting on emergence

10. Administer a precalculated dose of a paralytic agent.

	Dose	Characteristics	Cautions
SUCCINYLCHOLINE	1 - 1.5 mg/kg	Rapid onset, rapid recovery; fasciculation	Contraindicated in hyperkalemia, crush injury, renal failure, extensive burns, elevated intracranial or intraocular pressure
ROCURONIUM	0.6 - 1.2 mg/kg	No fasciculation	Longer acting-may be problematic if intubation attempt fails
VECURONIUM	0.08 - 0.1 mg/kg		

11. FROM THIS POINT UNTIL THE ENDOTRACHEAL TUBE IS VERIFIED AND SECURED, AN ASSISTANT MUST APPLY PRESSURE TO THE CRICOID CARTILAGE TO PREVENT ASPIRATION (SELLICK MANEUVER).

Laryngoscopy Technique

1. Check to verify effect of induction and paralytic agent.

2. Optimize patient position, if needed.

3. With suction available at hand, hold laryngoscope in left hand and endotracheal tube in right hand.

4. Open the patient's mouth with a right-handed scissor technique.

5. Insert the laryngoscope blade on the right side of the mouth and use it to sweep the tongue to the left.

6. Advance the blade until landmarks are recognized-usually the tip of the epiglottis or the arytenoids cartilages.

7. Lift (not lever) the laryngoscope in the direction of the handle to lift the tongue and posterial pharyngeal structures out of the line of sight, bringing the glottis into view (Mac or Miller Technique).

8. When the vocal cords or the arytenoids cartilages are clearly seen, advance the tube down the right side of the mouth, keeping the vocal cords in view until the last possible moment, then advance the tube through the vocal cords (Mac or Miller Technique).

9. Insert the tube to 23cm (at incisors) in men and 21 cm in women, then inflate the cuff.

10. Attach bag ventilator to tube and verify tube position immediately.

11. Listen for breath sounds over epigastrium (one breath), then to each hemithorax in the midaxillary line (one breath on each side).

12. Attach CO2 detector to tube or use end-tidal CO2 monitor to verify return of carbon dioxide with each breath

13. Use esophageal syringe or bulb syringe to verify tube is in noncollapsing trachea (caution- this technique may be falsely negative if tube is in esophagus and stomach is full of air).

14. Secure tube in position.

15. Ensure proper attachment to mechanical ventilator and review ventilator settings.

16. Consider ongoing sedation, particularly if induction agent may wear off before paralytic agent.

Complications

1. Can't intubate, but can ventilate with mask -- continue mask ventilation until more experienced laryngoscopist arrives, defer intubation or consider alternative technique, such as fiberoptic intubation.

2. Can't intubate, can't ventilate – see “Failed Airway” – Appendix H.

3. Aspiration-avoidable if Sellick maneuver done properly and maintained throughout procedure.

4. Trauma from laryngoscope.

    a. Teeth-avoidable with proper laryngoscopy technique.

    b. Soft tissues (bleeding)-usually avoidable with proper laryngoscopy technique.

    c. Edema-usually due to repeated attempts at laryngoscopy; key is to optimize something with each new attempt, not simply repeat procedure without addressing a possible reason for failure.

5. Equipment failure-have backup equipment nearby and verify that everything works beforehand.

Annex T
Positive Expiatory End Pressure
(PEEP)

Indications

- Acute lung injury and acute respiratory distress syndrome
- Carcinogenic pulmonary edema
- Diffuse pneumonia requiring mechanical ventilation
- Atelectasis associated with severe hypoxemia
- Other forms of severe hypoxemic respiratory failure

Contraindications

- Pneumothorax without pleural catheter
- Intracranial hypertension
- Hypovolemia (unless concomitantly treated)
- Bronchopleural fistula
- Recent pulmonary resection surgery

Effects and Mechanisms

1. Gas exchange

    a. Redistributes fluid within the alveoli and reduces intrapulmonary shunting.

    b. Improves arterial Oxygenation (PaO2).

    c. Reduces FIO2 requirements and risk of OXYGEN toxicity.

2. Lung mechanics

    a. Helps prevent alveolar collapse.

    b. Stabilizes and recruits lung units.

    c. Increases functional residual capacity.

    d. Improves lung compliance

    e. Shifts tidal deflections to the right along the inspiratory pressure-volume curve (Fig. T–1), minimizing potential for ventilator-induced lung injury by preventing repetitive collapse of lung units at end-expiration followed by re-opening during inspiration.

    f. May decrease the inspiratory work of breathing due to auto-PEEP in patients with obstructive airway disease.

3. Hemodynamic effects of PEEP-induced increases in intrathoracic pressure

    a. Increases intraluminal central venous pressure.

    b. Decreases venous return.

    c. Decreases left and right ventricular preload (end-diastolic volume)

    d. Increases right ventricular afterload.

    e. Decreases cardiac output, as a result of the above effects.

f. Hypotension and organ hypo perfusion can occur.

g. Reduction of both cardiac output and blood pressure is particularly likely in the presence of hypovolemia.

h. Decreases left ventricular afterload.

i. Decreases ventricular compliance.

j. Increases intracranial pressure, by increasing central venous pressure.

General
Positive end-expiratory pressure (PEEP) refers to pressure in the airway at the end of passive expiration that exceeds atmospheric pressure. The term is applicable to patients receiving mechanical ventilation. For spontaneously breathing subjects, the term continuous positive airway pressure (CPAP) is used when inspiratory and expiratory portions of the circuit are pressurized above atmospheric pressure. Positive end-expiratory pressure is used mainly to recruit or stabilize lung units and improve Oxygenation in patients with hypoxemic respiratory failure.

Effects of PEEP	
Beneficial	**Adverse**
➢ Usually improves Oxygenation ➢ Stabilizes and recruits lung units ➢ Improves lung compliance ➢ Minimizes potential for ventilator-induced lung injury	➢ May worsen gas exchange ➢ Decreases cardiac output ➢ Can cause barotraumas ➢ Interferes with assessment of hemodynamic pressures

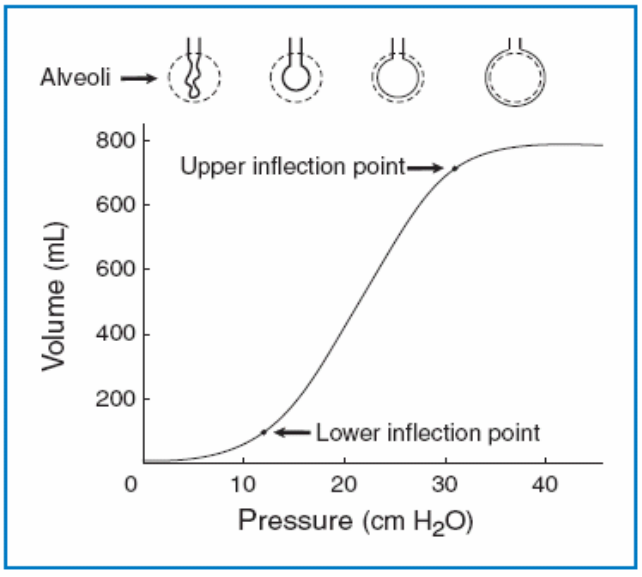


Figure T–1. Lung inspiratory pressure–volume curve in a patient with acute respiratory distress syndrome. The outlines at the top of the graph indicate the state of alveolar inflation relative to maximum physiologic distention (dashed circles). The central linear portion of the curve demonstrates that large volume changes result when pressure changes occur between the two inflection points; i.e., when lung compliance, represented by the slope of the pressure–volume curve, is maximal. At airway pressures above the upper inflection point, compliance decreases, the limit of lung distention is approached, and the risk of barotraumas is high. Airway pressures below the lower inflection point are associated with low compliance, alveolar collapse, and atelectasis. A proposed strategy for optimizing mechanical ventilation and PEEP is to select a PEEP level just above the lower inflection point, and maintain plateau airway pressures below the upper inflexion point.

Procedure (Initiation and Titration of PEEP)

1. Begin PEEP at 5cm H2O.
2. Increase or decrease in increments of 2 or 3cm H2O.

3. After each adjustment of PEEP, assess effects on pulmonary function, pressure–volume relationships, Oxygenation, and hemodynamics (see Monitoring section, below).

4. Goal of titration is to achieve optimal PEEP, which may be defined as the level of PEEP that allows the lowest FIO2 (or FIO2 less than 0.50, if achievable) while maintaining adequate Oxygenation (PaO2 greater than 60 torr, SaO2 greater than 0.90) and avoiding uncorrectable adverse effects induced by PEEP.

5. Alternative proposed definitions of optimal PEEP

   a. PEEP set to 2 cm H2O above the lower inflection point of the inspiratory pressure–volume curve (see Fig. T–1).

   b. Level of PEEP associated with maximal lung compliance.

   c. Level of PEEP associated with maximal systemic OXYGEN delivery.

   d. Level of PEEP associated with minimum pulmonary venous admixture (intrapulmonary shunt).

Monitoring

1. Observe for development of bronco-trauma.

   a. Manifestations include pneumothorax (including tension pneumothorax), subcutaneous emphysema, pneumomediastinum, interstitial emphysema, pneumoperitoneum, pneumopericardium, gas cysts, and systemic gas embolism.

   b. Associated with plateau airway pressures greater than 35 cm H2O, particularly in later stages of acute respiratory distress syndrome (ARDS) with lung remodeling.

2. Monitor pulmonary function.

   a. Monitor gas exchange by pulse oximetery or arterial blood gases.

   b. Monitor airway plateau pressure and inspiratory: expiratory (I : E) ratio.

   c. Assess effects on lung pressure–volume relationship (see Fig. O–1).

3. Monitor hemodynamic effects of PEEP.

   a. Assess for changes in heart rate, blood pressure, and indicators of organ perfusion (e.g., urine output, sensorium, and blood lactate concentration).

   b. If available, monitor for changes in cardiac output and SpO2.

   c. Consider fluid challenge if hypotension or signs of hypo perfusion manifest.

   d. Positive end-expiratory pressure complicates interpretation of central venous pressure (CVP) and pulmonary artery occlusion pressure (PAOP).

      (1) Positive end-expiratory pressure increases measured (i.e., intraluminal) values of CVP and PAOP by increasing intrathoracic pressure. Preload, however, is decreased.

      (2) Right and left ventricular preload are dependent on transmural end-diastolic ventricular volumes (or corresponding pressures at a given level of ventricular compliance), and PEEP can increase the pressure on both sides of the cardiac chambers and intrathoracic veins.

      (3) Increased intraluminal venous pressure opposes venous return to the right and left heart, resulting in decreased ventricular filling and preload.

e. The degree of transmission of PEEP to intrathoracic pressure varies with the degree of lung injury and its effect on lung compliance.

4. Monitor for auto-PEEP.

a. Auto-PEEP, or intrinsic PEEP, is due to inadequate time for lung emptying in the setting of increased airway resistance and expiratory flow limitation.

(1) Can be caused by expiratory flow limitation (e.g., bronchospasm), severely decreased compliance (e.g., ARDS), and very high minute ventilation (e.g., hyperventilation or trauma).

(2) Adverse effects include increased work of breathing, risk of barotrauma or volutrauma, and hemodynamic compromise.

b. Auto-PEEP is quantified as the difference between mean alveolar pressure and external airway pressure at end-expiration.

(1) Newer generation ventilators can provide automated assessment of auto-PEEP.

(2) May be manually determined by placing patient on assist-controlled mode, occluding airway at end-expiration, and observing passive increase in airway pressure.

c. A goal of therapy should be to achieve the lowest practicable level of auto-PEEP.

Key Treatment Strategies for Minimizing Auto-PEEP:

1. **Aggressive bronchodilator therapy**
2. **Pain control and treatment of fever, to decrease minute volume**
3. **Adequate sedation; consider selective use of neuromuscular blockade**
4. **Minimize I/E; e.g., increase expiratory time and inspiratory flow rate, reduce tidal volume, reduce respiratory rate.**
5. **In some cases, judicious application of (extrinsic) PEEP will counter intrinsic PEEP and decrease the work of breathing.**

Annex U
Suctioning

Objectives
The EMT performs endotracheal and tracheostomy suctioning to:

- Maintain a patent airway.
- To improve Oxygenation and reduce the work of breathing.
- To remove accumulated tracheobronchial secretions using sterile technique.
- Stimulate the cough reflex.
- Prevent pulmonary aspiration of blood and gastric fluids.
- Prevent infection and atelectasis.

Procedure

1. Wash hands. Reduces transmission of microorganisms.

2. Assess patient's need for suctioning. Since endotracheal suctioning can be hazardous and causes discomfort, it is not recommended in the absence of apparent need.

3. Don goggles and mask or face shield. Potential for contamination.

4. Turn on suction apparatus and set vacuum regulator to appropriate negative pressure. Recommend 80-120 mmHg; adjust lower for children and the elderly. Significant hypoxia and damage to tracheal mucosa can result from excessive negative pressure.

5. Prepares suction apparatus. Secure one end of connecting tube to suction machine, and place other end in a convenient location within reach.

6. Use in-line suction catheter or open sterile package (catheter size not exceeding one-half the inner diameter of the airway) on a clean surface, using the inside of the wrapping as a sterile field.

7. Prepares catheter and prevents transmission of microorganisms. Catheter exceeding one-half the diameter increases possibility of suction-induced hypoxia and atelectasis.

8. Prepare catheter flush solution. With in-line catheter use sterile saline bullets to flush catheter. With regular suctioning set up sterile solution container and being careful not to touch the inside of the container, fill with enough sterile saline or water to flush catheter.

9. With in-line suction catheter use clean gloves. With regular suctioning, done sterile gloves. Maintain sterility. Universal precautions. In regular suctioning the dominant hand must remain sterile throughout the procedure.

10. Pick up suction catheter, being careful to avoid touching nonsterile surfaces. With nondominant hand, pick up connecting tubing. Secure suction catheter to connecting tubing. Maintains catheter sterility. Connects suction catheter and connecting tubing.

11. Ensures equipment function. Check equipment for proper functioning by suctioning a small amount of sterile saline from the container. (Skip this step in in-line suctioning).

12. Remove or open **OXYGEN** or humidity device to the patient with nondominant hand. (Skip this step with in-line suctioning). Opens artificial airway for catheter entrance. Have second person assist when indicated to avoid unintentional extubation.

13. Replace **OXYGEN** delivery device or reconnect patient to the ventilator. Hyper Oxygenate and hyperventilate via 3 breaths by giving patient additional manual breaths on the ventilator before suctioning. Hyper Oxygenation with 100% **OXYGEN** is used to offset hypoxemia during interrupted Oxygenation and ventilation. Preoxygenation offsets volume and **OXYGEN** loss with suctioning. Patients with PEEP should be suctioned through an adapter on the closed suction system.

14. Without applying suction, gently but quickly insert catheter with dominant hand during inspiration until resistance is met; then pull back 1-2cm. Catheter is now in tracheobronchial tree. Application of suction pressure upon insertion increases hypoxia and results in damage to the tracheal mucosa.

15. Apply intermittent suction by placing and releasing dominant thumb over the control vent of the catheter. Rotate the catheter between the dominant thumb and forefinger as you slowly withdraw the catheter. With in-line suction, apply continuous suction by depressing suction valve and pull catheter straight back. Time should not exceed 10-15 seconds. Intermittent suction and catheter rotation prevent tracheal mucosa when using regular suctioning methods. Unable to rotate with closed- suction method.

16. Replace **OXYGEN** delivery device. Hyper Oxygenate between passes of catheter and following suctioning procedure. Replenishes **OXYGEN**. Recovery to base PaO2 takes 1 to 5 minutes. Reduces incidence of hypoxemia and atelectasis.

17. Rinse catheter and connecting tubing with normal saline until clear. Removes catheter secretions.

18. Monitor patient's cardiopulmonary status during and between suction passes. Observe for signs of hypoxemia, e.g. dysrhythmias, cyanosis, anxiety, bronchospasms, and changes in mental status.

19. Once the lower airway has been adequately cleared of secretions, perform nasal and oral pharyngeal or upper airway suctioning. Removes upper airway secretions. The catheter is contaminated after nasal and oral pharyngeal suctioning and should not be reinserted into the endotracheal or tracheostomy tube.

20. Upon completion of upper airway suctioning, wrap catheter around dominant hand. Pull glove off inside out. Catheter will remain in glove. Pull off other glove in same fashion and discard. Turn off suction device. Reduces transmission of microorganisms.

21. Reposition patient. Supports ventilatory effort; promotes comfort; communicates caring attitude.

22. Reassess patient's respiratory status. Indicates patient's response to suctioning.

23. Dispose of suction liners and connecting tubing, sterile saline solution every 24 hours and set up new system. Decreases incidence of organism colonization and subsequent pulmonary contamination. Universal precautions.

Precautions

1. Minimize suctioned-induced atelectasis and hypoxemia:

   a. Avoid using catheters larger than one-half the diameter of the airway.

   b. Administer one or more postsuctioning hyperinflations, using manual or sigh breaths on the ventilator or BVM if not ventilated.

2. Maintain rigorous sterile technique when suctioning the intubated patient. Impaired pulmonary defense systems and invasive instrumentation of the pulmonary tract predisposes these patients to colonization and infection. Never use same catheter to suction the trachea after it has been used in the nose or the mouth.

3. Limit the frequency of suctioning and avoid, as much as possible, catheter impaction in the bronchial tree when the patient is anticoagulated or when hemorrhage from suction-induced trauma is evident.

4. Minimize the frequency and duration of suctioning when patient is on positive end-expiratory pressure (PEEP) greater than 5cm or continuous positive airway pressure (CPAP). Small suctioning-induced changes may have profound effects on these marginally Oxygenated patients.

5. Maintain awareness of the limitations of ET/tracheal suctioning. Maneuvers and catheter design have been proposed to increase the likelihood of passage into the left bronchus; however, these have been shown to be of limited success. Because the left main stem bronchus emerges from the trachea at the 45-degree angle from

the vertical, suction catheters are almost inevitable passed into the right bronchus (when they pass the carina) despite head-turning, etc.

6. The use of saline installations for loosening secretions has been controversial and recent research shows that in fact it is detrimental and poses a greater risk of pneumonia for the patient.